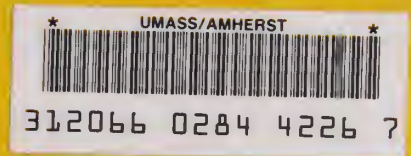
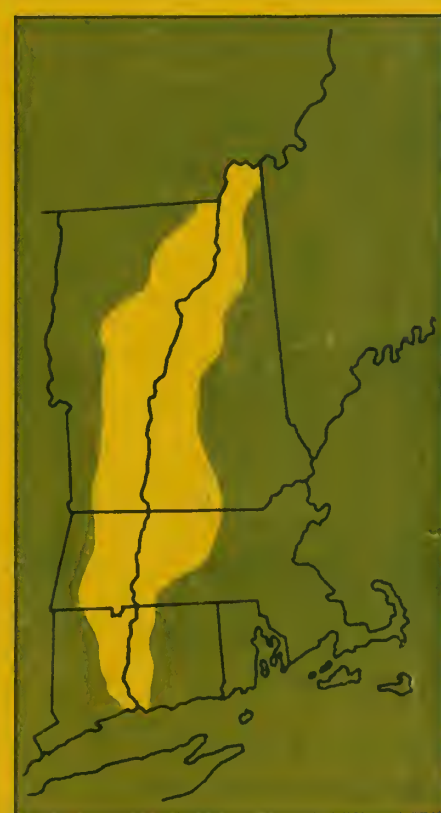


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THE NERBC 1980 CONNECTICUT RIVER BASIN PLAN



NEW ENGLAND RIVER BASINS COMMISSION

FINDINGS
AND RECOMMENDATIONS
ON THE
CONNECTICUT RIVER BASIN
COMPREHENSIVE
WATER AND RELATED LAND
RESOURCES INVESTIGATION

NEW ENGLAND RIVER BASINS COMMISSION
FINDINGS AND RECOMMENDATIONS
ON THE
CONNECTICUT RIVER BASIN
COMPREHENSIVE WATER AND RELATED LAND
RESOURCES INVESTIGATION

New England River Basins Commission

Boston, Massachusetts

January 1, 1972



NEW ENGLAND RIVER BASINS COMMISSION

55 COURT STREET · BOSTON, MASSACHUSETTS 02108

PHONE: (617) 223-6244

January 1, 1972

TO: The Chairman, Water Resources Council;
The Governors and Legislatures of Connecticut, Massachusetts,
New Hampshire and Vermont

I am pleased to submit the New England River Basins Commission's findings and recommendations on the Connecticut River Basin comprehensive water and related land resources investigation. The NERBC 1980 Connecticut River Basin plan has been adopted by the Commission pursuant to the Water Resources Planning Act, Public Law 89-80, section 204(3), as an increment of a comprehensive, coordinated joint plan for the water and related land resources of New England.

The field level investigation was conducted by a joint Federal-State Coordinating Committee chaired by the New England Division, Corps of Engineers, under authority of U. S. Senate resolution, May 11, 1962. The Commission participated in the study and prepared its findings and recommendations under authority of the Water Resources Planning Act.

The Commission's report is based on the Coordinating Committee report and on the response to the Coordinating Committee and draft Commission reports. These inputs to the 1980 NERBC Basin plan are summarized in this report.

Accompanying this report and appended to it by reference are the reports of the Connecticut River Basin Coordinating Committee; comments on the Coordinating Committee report, including the report of the Citizens Review Committee; a draft environmental impact statement prepared by the Coordinating Committee pursuant to the National Environmental Policy Act; and comments on the draft Commission report.

The Coordinating Committee report contained recommendations for the conservation and development of the Basin's water and related land resources. The response to the report reflected a predominant concern with environmental implications particularly of major structural alterations.

The Commission's response is to initiate with this report a proposal to conduct a Basinwide environmental reconnaissance and restudy of flood management alternatives, as part of a study designed to supplement the field level investigation. A flood management plan for the Basin will be prepared under the overall management of the Commission's Connecticut River Basin Program, and will be considered for adoption as part of the 1980 NERBC Basin plan.

The Commission is mindful that in postponing decisions concerning alternative flood management measures a potential risk is incurred of exposure to flood hazard in major flood damage centers in the Basin. At the same time, the Commission accepts the Coordinating Committee's findings that there are unmet needs that call for major actions now.

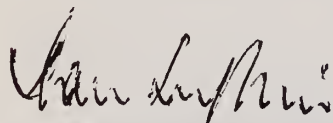
I am hopeful that the Congress and the Basin States will prompt action to meet these needs and will work closely with the Commission in the supplemental study.

Sincerely,

A handwritten signature in dark ink, appearing to read "Frank Gregg", with a stylized flourish at the end.

R. Frank Gregg
Chairman

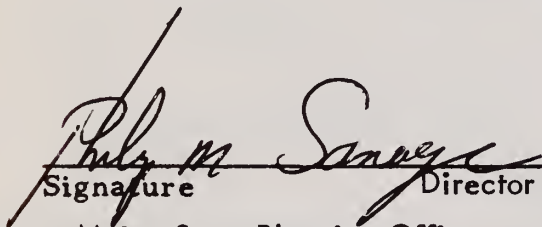
The undersigned, members of the New England River Basins Commission, recommend adoption of the NERBC 1980 Connecticut River Basin Plan as part of the Commission's comprehensive coordinated joint plan for the water and related land resources of New England, pursuant to the Water Resources Planning Act. The undersigned further recommend that the plan be transmitted, together with the Coordinating Committee report, comments on the Coordinating Committee and draft Commission reports and other documents appended by reference, to the Water Resources Council and to the Governors and Legislatures of Connecticut, Massachusetts, New Hampshire and Vermont.



Dan W. Lufkin
Commissioner
State of Connecticut
Dept. of Environmental
Protection



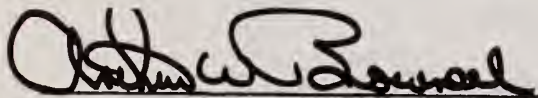
Signature R. W. Pedersen
New York State Department of
Environmental Conservation
State/Agency



Signature Director
Maine State Planning Office
State/Agency



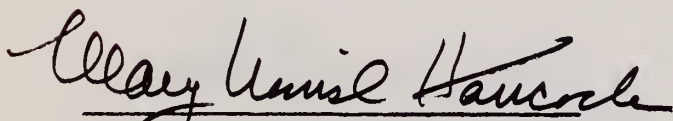
Signature
RHODA ISLAND
State/Agency



Signature
Massachusetts and
State/Agency
Chairman, Merrimack River
Valley Flood Control Commission



Signature Robert B. Williams
Vermont
State



Signature
N.H. Office of State
State/Agency Planning



Donald G. Burbank
State Conservationist
United States Department
of Agriculture

Frank P. Bane

FRANK P. BANE, Colonel

Signature

NED, Corps of Engineers

State/Agency

Wick by 9th

Signature

HVO, Region I

State/Agency

Wesley Johnson

Signature

US Atomic Energy Comm

State/Agency

Mark Ahlson

Signature

Interior

State/Agency

Ralph F. Lesge

Signature

Department of Commerce

State/Agency

Stanley B. Davis

Signature

U. S. Department of Transportation
Federal Highway Administration, Region One

State/Agency

John S. Styler

Signature

Environmental Protection
Agency

W. G. L. Jr.

Signature

Interstate Sanitation Commission

State/Agency

John H. Spellman

John H. Spellman

Signature

Federal Power Commission

State/Agency

Alfred E. Pelozin

Signature

Executive Secretary

State/Agency

New England Interstate Water

Pollution Control Commission

Donald Putnam

Signature

H. E. W.

State/Agency

William S. Hise

Signature

T. R. V. F. C. C.

State/Agency

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SUMMARY
OF
THE NERBC 1980 BASIN PLAN

SUMMARY: NERBC 1980 CONNECTICUT RIVER BASIN PLAN*

The New England River Basins Commission recommends that the water and related land resources of the Connecticut River Basin be managed in accordance with the 1980 Connecticut River Basin plan. In this plan the Commission presents its findings and recommendations based upon: (1) the Connecticut River Basin comprehensive water and related land resources investigation conducted by a Federal-State Coordinating Committee; (2) the response to the report of the Coordinating Committee; and (3) the response to the draft findings and recommendations of the Commission.

The principal motive of the plan is the development of natural resources in the Basin to meet economic and environmental needs -- including the need for jobs, housing, protection from natural catastrophes, and other human essentials -- where development is reconcilable with preservation and enhancement of the Basin environment. The premise that the Basin's environmental quality is its primary economic asset underlies every recommendation for resource development. It is emphasized that implementation of the plan cannot be achieved without sound management of population and economic growth throughout New England, to provide balanced distribution of demands upon natural resources in accordance with their character and availability.

The Commission adopts the plan as an increment of a comprehensive, coordinated joint plan for the water and related land resources of New England.

The 1980 Basin plan contains the following principal recommendations in order of priority. All recommendations involving major environmental alterations are subject to satisfactory completion of environmental impact evaluations pursuant to the National Environmental Policy Act. Other important qualifying recommendations are set forth in the report.

*This is a shorthand reference to the 1980 Basin plan. It should not be considered a substitute for the full report or for any part of the report. Those concerned with the implications of the plan for Basin resource management are referred to the full report.

<u>Priority</u>	<u>Estimated Public Cost</u>
1. <u>SUPPLEMENTAL STUDY PROGRAM</u>	\$700,000

Recommendation: a two and one-half year study consisting of five interrelated tasks to supplement the field level investigation:

environmental reconnaissance of the Basin;

evaluation of the degree of additional flood protection needed;

assessment of legal, institutional and financial arrangements for flood protection and flood plain management;

evaluation of flood management alternatives, with environmental and economic impact evaluations; and

formulation of a Basin flood management plan.

Objective:

to develop environmental information generally useful for Basin resource management and applied specifically in a reexamination of flood management alternatives in the supplemental study program;

to formulate a Basin flood management plan for incorporation in the 1980 Basin plan.

Responsibility: New England River Basins Commission.

2. LAND ACQUISITION/ CONTROLS

(a) Nonstructural flood plain management

\$100 million

Recommendation:

flood plain zoning along over 200 miles of the Connecticut River from Saybrook, Connecticut, to above White River Junction, Vermont;

preservation and controlled use of the undeveloped or sparsely settled flood plains, with particular reference to flood plains now in agricultural, recreational or other open space uses;

acquisition or zoning of presently unprotected wetland and upland areas within the flood plain;

public information programs on the availability of flood plain insurance and flood fighting;

improved operation of flood control reservoirs, through expansion of a Corps of Engineers computerized network of remote river stage data stations; and

improvement and expansion of flood forecasting service provided by the National Weather Service forecast center.

Objective:

to preserve the undeveloped flood plain as a unique and irreplaceable environmental resource for open space recreational and other uses compatible with its preservation;

to prevent further encroachment of the flood plain and reduce future flood damage.

Responsibility: shared responsibility among Federal, State and local governments, including counties and regional planning agencies, for flood plain management, with emphasis on Federal-State financial and administrative responsibility for flood plain delineation, zoning and acquisition.

(b) Reservoir site acquisition

\$30 million

Recommendation: preservation and controlled use of proposed sites of large flood control and multiple purpose reservoirs and Public Law 566 small watershed impoundments included within the scope of the supplemental study program, with provision for interim outdoor recreational use pending commitments on development and for permanent outdoor recreational use in the case of sites abandoned for reservoir use.

Qualification: provided that such use is compatible with soil suitability and neighboring land uses.

Objective: to preserve options for appropriate use of unique natural environments pending commitments on reservoir development or alternative uses.

Responsibility: Federal, State, local, and appropriate private organizations.

(c) Streambank acquisition

\$25 million

Recommendation: streambank acquisition.

Objective:

to provide public access to fishery resources;
(coordinated with other measures) to protect the flood plains from further encroachment and to preserve reaches of river identified as wild, scenic or recreational.

Responsibility: Federal, State, local and appropriate private organizations.

(d) Estuary land zoning/acquisition*

\$10 million

Recommendation: preservation of the remaining undeveloped portions of the estuary.

Objective: to preserve the undeveloped estuary for uses compatible with preservation of its unique and irreplaceable environmental resources.

Responsibility: Federal, State, local and appropriate private organizations.

*The Connecticut River estuary is included within the scope of the Commission's study of the water and related land resources of Long Island Sound. Estuarine effects of flood management alternatives will be assessed in the supplemental study program.

(e) National Recreation Area land acquisition/zoning \$ 40 million

Recommendation: acquisition or zoning of sites included as Federal and State elements of the proposed Connecticut River National Recreation Area/Historic Riverway.

Responsibility: Federal, State, local and appropriate private organizations.

3. WASTEWATER MANAGEMENT \$260 million*

Recommendation:

- (a) Secondary waste treatment: adoption by all pollution sources of at least secondary water pollution control treatment facilities, with minimum 85 percent removal of biochemical oxygen demand (BOD);
- (b) Advanced waste treatment: development and application of advanced waste treatment on a selective basis where needed, along the lines of an investigation of advanced waste treatment concepts by the Environmental Protection Agency and the Corps of Engineers in the Merrimack River Basin;
- (c) Monitoring: expanded water quality monitoring to evaluate the impact of recommended improvements;
- (d) Research: additional research on low flow augmentation; combined sewer discharge; rural and urban pollutants; sewage diversions; sludge deposits; bank erosion; and multiple thermal discharges.

Objective:

- (a) to attain joint State-Federal water quality standards established under the Water Quality Act of 1965;

*Principally for secondary waste treatment. See p. 33.

(b) to prevent major and moderate deficiencies in the dissolved oxygen level of certain presently degraded reaches of the Upper Connecticut, Otter, North, Quaboag, Ware, Little Pequabuck and Hockanum Rivers;

(c) to provide broader, more effective surveillance of the Basin's water quality.

Responsibility: Federal, State, local and appropriate private organizations.

4. RESOURCE PLANNING ASSISTANCE, SOIL SURVEYS AND RESOURCE CONSERVATION AND DEVELOPMENT PROJECTS \$27 million

Recommendation:

Accelerated planning assistance to 180 towns in the preparation of resource inventories, town soil reports and interpretations, flood plain information studies and soil surveys involving 1.5 million acres of non-Federal lands;

soil surveys and watershed analyses on approximately 306,000 acres and fish and wildlife surveys and watershed analyses on 30,500 acres of National forest land;

initiation of four additional resource, conservation and development projects under Public Law 89-796 and continuation of assistance on four existing resource conservation and development projects: North Country (1.2 million acres in New Hampshire); East Central Vermont (23 towns in Vermont); Berkshire-Franklin (600,000 acres in Massachusetts); and Eastern Connecticut (26,000 acres).

Responsibility: Federal, State.

(a) Large flood control and multiple purpose reservoirs*

Recommendation: Beaver Brook reservoir, as authorized by the Flood Control Act of 1968, on the Ashuelot River, New Hampshire, subject only to further legislative or executive action. The Commission recommends continual evaluation for adverse environmental effects throughout project planning, development and operation, with mitigation of environmental damage or repair by removal of the cause.

Objective: to provide flood protection, water supply and recreation principally for Keene, New Hampshire.

Responsibility: Federal.

(b) Existing reservoirs

- (1) Recommendation: modification of three existing Corps of Engineers flood control reservoirs to include uses for recreation, fish and wildlife enhancement and water supply:

Union Village, on the Ompompanoosuc River in Vermont (recreation), subject to improvement of water quality on the West Branch;

Tully, on the Millers River in Massachusetts (recreation and water diversion by flood skimming to Quabbin reservoir), subject to recognition of riparian rights of Basin interests, and conditioned on creation of a regional mechanism for allocating water, if feasible; on prior measurement of impacts used in measuring "excess flows," and on prior determination and protection of alternative groundwater sources (See Water Supply, below); and Knightville, on the Westfield River in Massachusetts (recreation and low flow augmentation for fisheries enhancement), subject to the Commission's investigation of the replacement of lost wildlife habitat.

*Eight projects recommended by the Coordinating Committee have been withdrawn from the NERBC 1980 Basin plan at this time and are included within the scope of the supplemental study. These include two recommended for State implementation, Blackledge and Cold Brook (Connecticut), and six Corps projects: Meadow (Massachusetts); Bethlehem Junction, Claremont and Honey Hill (New Hampshire); and Gaysville and Victory (Vermont).

Qualifications: subject to satisfactory completion of environmental impact evaluations and appropriate remedies should ongoing studies reveal a risk of significant adverse impact.

Responsibility: Federal.

(2) Recommendation: additional research:

continuing evaluation in the supplemental study program of the possibility of reregulating total Basin-wide existing power storage capacity for flood protection, recreation and other purposes.

Responsibility: New England River Basins Commission.

continuing studies to improve utilization of existing dry-bed flood control reservoirs for possible agricultural, recreational or other use during periods when they are normally dry.

Responsibility: Federal.

(c) Local flood protection works

- (1) Recommendation: local flood protection works on the Westfield and Little Rivers in Westfield, Massachusetts, substantially as authorized by Congress and by the Massachusetts Legislature, subject only to further legislative or executive action. The Commission recommends continual evaluation for adverse environmental effects throughout project planning, development and operation, with mitigation of environmental damage or repair by removal of the cause.

Responsibility: Federal, State, local.

- (2) Recommendation: three local protection projects considered necessary to complement other flood control measures:

Lancaster, New Hampshire (small ice retention dam and channel improvement);

St. Johnsbury, Vermont (dike and pumping station); and

Hartford, Connecticut (conduit with headwall and pumping structure).

Qualifications: subject to satisfactory completion of environmental impact evaluations.

Responsibility: Federal, State, local.

(d) Upstream watershed projects

- (1) Recommendation: three currently planned Public Law 566 upstream watershed projects for which State executive approvals have been obtained, subject only to further legislative or executive action:

West Branch, Westfield River, Massachusetts
(flood control, recreation, fish and wildlife);

Upper Quaboag River, Massachusetts (flood
prevention, recreation, water quality and
water supply); and

Sugar River, New Hampshire (flood prevention
and recreation).

The Commission recommends continual evaluation for adverse environmental effects throughout project planning, development and operation, with mitigation of environmental damage or repair by removal of the cause.

Responsibility: Federal, State, local.

- (2) Recommendation: two upstream watershed projects currently being planned under Public Law 566:

Indian - Mascoma River, New Hampshire
(flood prevention and possibly recreation); and

Indian Brook, New Hampshire (flood prevention
and possibly recreation).

Qualifications: subject to satisfactory completion of environmental impact evaluations.

Responsibility: Federal, State, local.

- (3) Recommendation: seven potential Public Law 566 upstream watershed projects:

Mill River, Massachusetts (flood prevention, recreation and water supply);

Mohawk River, New Hampshire (flood prevention and recreation);

East Branch, North River, Vermont (flood prevention, recreation and fish and wildlife);

North Branch, Deerfield River, Vermont (flood prevention, recreation and fish and wildlife);

Whetstone project, Vermont (flood prevention, recreation and fish and wildlife);

Ball Mountain Brook, Vermont (flood prevention, recreation and fish and wildlife); and

Passumpsic-Moose Rivers, Vermont (flood prevention, recreation and fish and wildlife).

Qualifications: subject to local sponsorship and satisfactory completion of environmental impact evaluations.

Responsibility: Federal, State, local.

- (4) Recommendation: further in-depth evaluation of five additional Public Law 566 upstream watershed projects to determine economic feasibility:

Upper Ammonoosuc River, New Hampshire (flood prevention, recreation, water quality and water supply);

Gale River, New Hampshire (flood prevention and possibly recreation);

Blow-Me-Down Brook, New Hampshire (flood prevention and possibly recreation);

Black River, Vermont (flood prevention); and

Wells River, Vermont (flood prevention and possibly recreation).

Qualifications: subject to local sponsorship and satisfactory completion of environmental as well as economic evaluations.

Responsibility: Federal, State, local.

6. WATER SUPPLY

\$185 million

- (1) Recommendation: diversion of Connecticut River water by flood skimming into Quabbin reservoir from the Northfield Mountain (Massachusetts) pumped storage power project, as authorized by the Massachusetts Legislature. (Modification of Tully reservoir for water diversion into Quabbin reservoir is recommended under Single and Multiple Purpose Flood Control Structures, (b) Existing reservoirs, above.).

Objective: to meet short term water supply needs of the Metropolitan District Commission service area by adding 72 mgd to the capacity of Quabbin reservoir (Tully would add 55 mgd).

Qualifications: The Northfield Mountain diversion project has been authorized by Massachusetts law and its inclusion in the 1980 Basin plan is subject only to further legislative or executive action. The Commission recommends continual evaluation for adverse environmental effects throughout project planning, development and operation, with mitigation of environmental damage or repair by removal of the cause.

The Commission recommends that all proposed diversions of Connecticut River water below the newly constructed nuclear power plant at Vernon, Vermont, including Northfield Mountain, be conditioned on satisfactory completion of environmental impact evaluations of the power plant. It is recommended that these evaluations include careful investigation of the possibility of radioactive contamination of Connecticut River water and its implications for the diversion of Connecticut River water into Quabbin reservoir. It is further recommended that proposed diversions be conditioned on adequate measures to prevent radioactive contamination of diverted water, including water quality monitoring.*

*The Corps of Engineers and the Massachusetts Department of Public Health are monitoring the Connecticut River below Vernon and into Quabbin reservoir for levels of natural and artificially caused radioactive contamination.

The amount of water that may be diverted at Northfield Mountain is limited by Massachusetts law over a three consecutive year period to 375 mgd for each day that river flow exceeds 17,000 cfs at Montague City. Diversion is prohibited by law on any day when flow is less than 17,000 cfs at Montague City.

Diversions at Tully and any diversions at Northfield Mountain above amounts presently authorized by law are subject to recognition of riparian rights and conditioned on creation of a regional mechanism for allocating water in which downstream States have a voice, if feasible; on prior measurement of impacts used in measuring "excess flows;" and on prior determination and protection of alternative groundwater sources.

Responsibility: Federal, State, regional, and appropriate private organizations.

- (2) Recommendation: expansion of municipal and industrial water supplies by proper development of available surface and groundwater supplies.

Responsibility: Federal, State, local and appropriate private organizations.

- (3) Recommendation: continued environmental studies of the feasibility of using water supply impoundments to meet recreational needs. The Commission recommends that specific consideration be given to expanded recreational development of Quabbin reservoir, in part for the benefit of Lower Basin metropolitan area residents in return for the allocation of Lower Basin water supply to meet out-of-Basin needs.

Responsibility: Federal, state, local.

10. RECREATION

(a) National Recreation Area/ Connecticut Historic Riverway \$80 million

- (1) Recommendation: establishment of a 56,700 acre Connecticut River National Recreation Area consisting of the following Federal elements: 23,500 acre Coos Scenic River unit in northern New Hampshire and Vermont; 12,000 acre Mount Holyoke unit in Massachusetts; 21,200 acre Gateway unit in Connecticut; and a 280-mile Connecticut Valley Trail and a Connecticut Valley Tourway.

Qualifications: subject to the approval of each unit by local citizens advisory committees and, in the case of the Coos unit, to the appointment and approval of an officially established advisory committee similar to the ones existing in Massachusetts and Connecticut; subject also to the understanding that the National Recreation Area concept is being modified by the Department of the Interior and, as the proposed Connecticut Historic Riverway, now emphasizes preservation of the Basin's existing landscape and cultural pattern in place of active outdoor recreational use.

- (2) Recommendation: establishment of a 56,700 acre Connecticut River National Recreation Area consisting of the following State elements: 18,300 acre Cockaponset State Forest, 4,400 acre Glastonbury Meadows State Park and 250 acre Windsor Locks-Kings Island State Park, in Connecticut; 4,800 acre Mount Tom State Park and 31,000 acre Northfield Mountain State Park in Massachusetts; and 14,000 acre Connecticut Lakes State Park, 15,400 acre Moore-Comerford Interstate Park, and a 27,500 acre Rogers Rangers Historic Riverway, in New Hampshire and Vermont.

Qualifications: subject to State or local approval.

- (3) Recommendation: Federal consideration of a sliding scale of Federal support for State and local actions based upon the degree of national and regional interests.
- (4) Recommendation: authorization and funding of Bureau of Outdoor Recreation staff assistance to the Basin States in organizing State and local responses to the Bureau's "New England Heritage" report.

(b) Urban recreational development \$ 10 million

- (5) Recommendation: high priority for water based recreational development within the urban environment.

Objective: to bring recreational opportunities close to heavy Lower Basin urban recreational demand centers.

Responsibility: Federal, State, local.

(c) Anadromous fisheries restoration \$ 20 million

- (6) Recommendation: erection of fish passage facilities at the Vernon, Turners Falls, Wilder and Bellows Falls main stem power dams and improvement or replacement of the fish passage facility at Holyoke dam, to accommodate increased numbers of fish expected to be passed through new facilities at other dams.

Objective: to increase the number of shad entering the river to two million annually and to permit Atlantic salmon to reach the Westfield and Deerfield Rivers in Massachusetts; the White and West Rivers in Vermont; and the Cold and Ammonoosuc Rivers in New Hampshire by 1980.

Responsibility: Federal, State, and appropriate private organizations.

- (7) Recommendation: installation of fish hatchery facilities to provide one million smolt (two-year-old salmon) annually.

Objective: environmental quality and partial satisfaction of fishing demand.

- (8) Recommendation: minimum flow releases of 0.2 cfs at four main stem power projects up for relicensing -- Wilder, Bellows Falls, Vernon and Turners Falls -- and study of minimum flow releases below all dams in the Basin to determine the desirability and feasibility of a 0.2 cfs release rate to assist in the assimilation of treated effluent.

(d) Recreational navigation improvements \$ 10 million

- (9) Recommendation: construction of a 32-mile recreational navigation channel between Hartford and Holyoke.

Objective: to accommodate an additional 4,000 boats and partially meet recreational boating demand.

Qualifications: provided that proposed alterations of the Windsor Locks Canal are acceptable to the State of Connecticut, and subject to satisfactory completion of environmental impact evaluations.

Responsibility: Federal, State, local.

- (10) Recommendation: dredging for recreational navigation in the 14-mile reach between Holyoke dam and the Northampton-Hatfield line.

Qualifications: subject to satisfactory completion of environmental impact evaluations.

Responsibility: Federal, State, local.

- (11) Recommendation: recreational navigation improvements on the main stem behind the Holyoke, Turners Falls, Vernon and Bellows Falls power dams, consisting of the removal of shoals, navigation aids and bypass trailer service.

Responsibility: Federal, State, local.

(e) National Forest improvements \$ 25 million

- (12) Recommendation: structural improvements on National Forest lands, including recreational facilities on 555 acres; three recreational impoundments which would provide 310 surface water acres; 225 miles of roads and trails; 37 fire control heliports; and 37 acres of fish and wildlife improvements.

Responsibility: Federal.

- (13) Recommendation: continued efforts to consolidate patterns of ownership within the National Forests to secure effective forest land management.

Responsibility: Federal.

8. LAND TREATMENT

\$ 33 million

Recommendation: land treatment measures on 64,000 acres of National Forest land and on over 1.2 million acres of non-Federal land, including 204,000 acres of agricultural land, 150,000 acres of urban land and 823,000 acres of private, non-industrial forest land.

Objective: reduction of runoff, erosion and sediment, soil conservation, and water quality improvement.

Responsibility: Federal, State, local.

9. WILD AND SCENIC RIVERS

\$ 25 million

Recommendation: a Basinwide wild and scenic river program to preserve and enhance reaches of river identified in Appendix H of the Coordinating Committee report as wild, scenic or recreational, including all or part of the following:

Ammonoosuc River, N.H.	Paul Stream, Vt.
Ashuelot River N.H.	Phillips Brook, N.H.
Clam River, Mass.	Podunk River, Ct.
Cold River, N.H.	Salmon River, Ct.
Deerfield River, Mass/Vt.	Sandy Brook, Ct.
Dickinson Creek, Ct.	Sawmill River, Mass.
Farmington River, Ct.	Scantic River, Ct.
Fawn Brook, Ct.	Swift River (Chicopee), Mass.
Hockanum River, Ct.	Tully River, Mass.
Indian Stream, N.H.	Upper Ammonoosuc River, N.H.
Ketch Brook, Ct.	Waits River, Vt.
Millers River, Mass.	Ware River, Mass.
Moose River, Vt.	Wells River, Vt.
Nash Stream, Vt.	West River, Vt.
Nulhegan River, Vt.	Westfield River, Mass.
Ompompanoosuc River, Vt.	White River, Vt.
Ottauquechee River, Vt.	Williams River, Vt.
Park River, Ct.	

Responsibility: Federal, State, local.

10. COMMERCIAL NAVIGATION IMPROVEMENTS \$ 5 million

Recommendation: enlargement of the present commercial navigation project from Saybrook Light to Hartford to a depth of 16 feet and to a width of 250 feet.

Qualifications: provided that suitable spoil areas are located for the placement of dredged material and subject to satisfactory completion of environmental impact evaluations.

Responsibility: Federal.

11. 118 IDENTIFIED UPSTREAM RESERVOIR SITES \$ 25 million

Recommendation: continuing consideration of 118 upstream impoundment sites with a total storage capacity of 463,000 acre-feet for possible development.

Objective flood water and sediment, recreation, fish and wildlife, low flow augmentation, and public water supply.

Qualifications: subject to State or local approval and conditioned on evaluation of individual and collective regional impacts.

Responsibility: State and local.

TOTAL COST \$980 million

The plan contains the following principal recommendations for which estimates of costs and priorities are not possible or appropriate.

POWER

Recommendation: development of power generating and transmission facilities to meet projected 1980 power needs in the Basin.

Qualifications: as warranted by the results of a two-year comprehensive study of electric bulk power facility siting in New England.

Objective of study: consideration of environmental and other factors in New England regionwide bulk power system planning.

Responsibility for study: Committee on Power and Environment of the New England River Basins Commission, New England Energy Policy Staff of the New England Regional Commission, and the electric power industry of New England.

PRESERVATION OF SITES

Recommendation: preservation of nearly 600 archeological and over 250 natural and historical sites in the Basin.

Objective: protection of priceless environmental assets from increasing pressures of urbanization, highway construction and recreational development.

Responsibility: Federal, State, local and appropriate private organizations.

IMPLEMENTATION

- (1) Recommendation: Federal- and State-supported Connecticut River Basin Program within the Commission.

Objectives: continuing, cooperative Basin planning under the auspices of the Commission; overall management and coordination of the supplemental study program; public information and education; and program evaluation.

- (2) Recommendation: Federal and State authorization of the 1980 Basin plan with adequate financial, legal and institutional arrangements for implementation.
- (3) Recommendation: organization within each Basin State of governmental powers and responsibilities to coordinate State, community and private resource planning for the portion of the Basin within each state, to provide for increased area representation in the planning process, and to participate in the allocation of Basin water and related land resources to meet in- and out-of-Basin needs.

CANADA

QUEBEC
VT.

QUE.
N.H.
ME.



LEGEND

- PROPOSED WILD AND SCENIC RIVERS
- PROPOSED FISH PASSAGE FACILITIES AT EXISTING POWER DAMS
- NATIONAL FORESTS
- PROPOSED PUBLIC LAW 566 UPSTREAM WATERSHED PROJECTS
- PROPOSED NATIONAL RECREATION AREA/HISTORIC RIVERWAY
- FEDERAL
- STATE
- FLOOD CONTROL AND MULTIPLE PURPOSES RESERVOIRS
 - AUTHORIZED BY CONGRESS AND INCLUDED IN NERBC 1980 BASIN PLAN
 - CORPS PROJECTS WITHDRAWN FROM NERBC 1980 BASIN PLAN TO BE RECONSIDERED WITH OTHER ALTERNATIVES IN SUPPLEMENTAL STUDY
 - PROJECTS RECOMMENDED FOR STATE IMPLEMENTATION, WITHDRAWN FROM NERBC 1980 BASIN PLAN TO BE RECONSIDERED WITH OTHER ALTERNATIVES IN SUPPLEMENTAL STUDY
 - PROPOSED MULTIPLE USE OF EXISTING RESERVOIRS

REFERENCE MAP
NERBC CONNECTICUT RIVER
BASIN PLAN

The purpose of this map is to assist in the identification of key geographic reference points in the NERBC 1980 Basin Plan. It is not a summary of the plan. Reference points and projects are omitted where it is felt that such assistance is not needed. Maps and other illustrations pertaining to all study elements are contained in the report of the Connecticut River Basin Coordinating Committee.



INTRODUCTION

This report has been prepared in compliance with section 204 (3) of the Water Resources Planning Act of 1965, Public Law 89-80, which provides for the review, revision and transmittal of comprehensive, coordinated joint plans for the water and related land resources of river basins. It presents to the President, to the Congress, to the States of Connecticut, Massachusetts, New Hampshire and Vermont, and to the people of the Connecticut River Basin and other affected areas within the New England region, findings and recommendations of the New England River Basins Commission based upon the Coordinating Committee report, Connecticut River Basin Comprehensive Water and Related Land Resources Investigation (October 1970), and on the response to the Coordinating Committee and draft Commission reports.

The management of the Basin's natural resources is of intense concern to a wide range of often conflicting interests. The primary purpose of the Basin planning process is to make possible informed and acceptable judgments among conflicting interests and thereby to provide sound and lasting guidance -- to State, Federal and local governments and to private interests -- for the future management of the Basin's resources.

This document, referred to as the 1980 Basin plan, has been adopted by the Commission, and is recommended for acceptance by the people of the Basin and other affected areas within New England, as an element of the Commission's comprehensive, coordinated joint plan for water and related land resources in New England, pursuant to the Water Resources Planning Act. It is also recommended for adoption by Basin States as an increment of statewide water and related land resource plans.

The Basin plan transmitted to the Water Resources Council and to the Governors and Legislatures of the Basin States is accompanied by the Coordinating Committee report and by comments by the Basin Governors, by heads of interested Federal agencies, by the Citizens Review Committee and by other affected interests on the Coordinating Committee and draft Commission reports. It is also accompanied by a draft environmental impact statement prepared by the Coordinating Committee in compliance with the National Environmental Policy Act. Texts of the comments and the report of the Citizens Review Committee are transmitted as separate documents and are incorporated by

reference as appendices to this report.

When it is transmitted to the Congress, the plan will consist of recommendations of the President. The President's recommendations concerning Federal action programs will be made either directly or by reference to recommendations of the Water Resources Council. The views of the Water Resources Council will in turn be referenced to findings and recommendations of the New England River Basins Commission.

A primary legislative function of the Basin plan is to serve as a supporting document, or information base, for project authorization and funding requests by Federal and State agencies. With reference to Federal actions, the Water Resources Planning Act governing the preparation and evaluation of river basin plans provides that nothing in the Act "shall be construed . . . to limit the authority of Congress to authorize and fund projects." Congressional authorization of Federal projects may be obtained without reference to the Basin plan. The President, the Water Resources Council and the Congress retain the prerogative of drawing upon the Coordinating Committee report, the views of individual departments and agencies, the comments of the Governors, the Citizens Review Committee and other sources.

Administrative authorizations of recommended Federal projects not already authorized by Congress are subject to evaluation by the Water Resources Council within the context of the Basin plan. Recommended Federal projects, for which Congressional and administrative authorizations have already been obtained or are being sought, may be reevaluated in the normal course of project authorization and funding apart from the disposition of the Basin plan. Similarly, the Basin plan does not bind State governments to any action recommended, nor does it impose any restriction on State actions not contemplated by the study.

The 1980 Basin plan recommended by the Commission was prepared in three phases over a period of approximately nine months: first, preparation of a staff draft (February - May); second, preparation of a draft approved by the Commission for public comment (June - July); and third, preparation of a final draft for Commission approval in response to the comments (October).

The first phase began at the conclusion of the 90-day review of the Coordinating Committee report February 1, with a compilation of findings and recommendations taken from the nine volume

Coordinating Committee report together with relevant comments. Recommendations and comments organized in the following categories for each of the 10 plan elements provided a logical foundation for related recommendations of the Commission:

existing resource development in the Basin:

Basin resource needs and/or projected demands:

recommended measures to meet needs; and

beneficial and adverse impacts of recommended measures.

Additional categories were established for planning objectives and assumptions; plan implementation costs; and priorities. When the basic inputs to the Commission's report had been compiled, and recommendations for the Commission's consideration had been prepared and reviewed at the staff level, a first draft of the Basin plan was prepared in a format suitable for editing by Commission members.

A committee of the Commission, composed of member States and agencies that participated in the field level investigation, was organized at the Commission's quarterly meeting June 16 to review the staff draft for technical errors and omissions and for its responsiveness to Governors' and department heads' comments on the Coordinating Committee report. Comments of the Commission Review Committee were taken into account in a revised draft released for public comment July 12.

Preparation of the final draft for Commission approval began in late September at the conclusion of a 60-day review period. Comments were received from the Basin Governors, from an interim Citizens Advisory Board, and from a representative range of Basin communities and other affected interests. A new section was added to the report summarizing the comments received and the Commission's response. The final draft was approved by the Commission, with modifications suggested by the Commission Review Committee, following the Commission's quarterly meeting October 18.

Because the field level investigation provided the supporting analysis for the 1980 Basin plan, the Commission's

findings and recommendations and the comments on the Coordinating Committee report are presented with reference to the findings and recommendations of the Coordinating Committee. Commission recommendations concerning resource management projects and programs are made with reference to each of the ten study elements included within the scope of the field level investigation: water quality; power; outdoor recreation; preservation of sites; anadromous fisheries restoration; fish and wildlife; water supply; navigation; upstream water and related land resources management; and flood control and multiple purpose reservoirs. The plan recommended by the Commission also contains recommendations concerning the estuary.

Resource management projects and programs recommended in the 1980 Basin plan fall into four categories: (1) recommendations of the Coordinating Committee that are approved essentially without qualification or (2) approved with qualifications; (3) recommendations on which no decision will be taken pending completion of additional studies; and (4) additional recommendations of the Commission, including a restudy of flood management alternatives. Approved recommendations of the Coordinating Committee are further distinguished according to whether they have already received legislative or executive authorization at the State or Federal level or are subject solely to State or local authorization.

Water and related land resources planning in the Connecticut River Basin has been a complex process. A considerable burden has been placed upon the public to make judgments on environmental and other tradeoffs within the context of Basinwide resource management, based on an understanding of the content, scope and status of each phase of the process. Complicating factors were the enactment of the Water Resources Planning Act and the creation of the New England River Basins Commission mid-way through the field level investigation. A short time later, long overdue public recognition of the importance of environmental quality to human wellbeing resulted in the enactment of the National Environmental Policy Act and a generally accepted, if not formalized, realignment of resource management objectives.

Inevitably the prescribed procedure for obtaining a representative, informed public response to the content of the Basin plan took on the additional purpose of informing the public of the role and nature of the plan at each point in its evolution. The Commission has emphasized that its findings and recommendations, based on the Coordinating Committee report and the response to the report, differ in important respects from the findings and recommendations of the Coordinating Committee based on the field level investigation. Moreover, it has been emphasized that the Basin plan will include recommendations of the Water Resources Council and the President when it is ultimately transmitted to the Congress.

The relationship of Basin planning to the political process has also needed clarification, because of a strongly felt concern that the existence of a Basin plan would supersede or otherwise weaken existing procedures for continuing expression and protection of the public interest in Basin resource management. It has been pointed out that protection of the public interest is provided within the larger political process, of which comprehensive water and related land resource planning is a supporting part. Legislative judgments affecting specific communities and other interests are made with agency project planning support, and these are accompanied by opportunities normally provided for public discussion and for appropriate legislative response. Whether the Commission's findings and recommendations adequately serve the public interest in Basin resource management therefore remains a matter for the people to decide, taking into account each phase of the planning process and the larger political process of which it is a part.

Resolutions have been received from the Massachusetts House of Representatives, the City of Springfield and several other communities in the Massachusetts portion of the Basin, urging the Commission to defer further review and implementation of the Basin plan until substantial conformance with the National Environmental Policy Act can be assured. The Commission's response is set forth in the report. Although it is felt that an indefinite deferral of the plan pending completion of additional research would not serve the public interest as effectively as the procedure that has been adopted, the Commission nevertheless considers these resolutions a welcome measure of genuine, constructive public concern for the quality of the environment, and expresses the hope that the adopted procedure will in the long run encourage the environmental vigilance of their sponsors.

The Water Resources Council has established a procedure for the submission of proposed revisions of completed river basin plans to river basin commissions and for related commission and Council action. Interested agencies and individuals may submit requests for revision of the 1980 Basin plan to the Commission after the plan has been transmitted to the Congress, where revision may be warranted to reflect changes in economic and social goals or to accommodate technological advances or other circumstances that affect both problems and their solutions. The prescribed procedure requires a detailed rationale for requested revisions, setting forth their relationship to the completed plan, to other plan elements and Basin needs, and their regional environmental and other impacts. Requests for revision will be subject to review by Commission member States and agencies in accordance with the Water Resources Planning Act, and may be accompanied by Commission recommendations when transmitted to the Water Resources Council.

Member States and agencies of the Commission Review Committee worked conscientiously with the Commission staff to consider carefully the Commission's response to the comments. Without their experience and judgment, the preparation of this report would have been an immensely more difficult task.

Preparation of the Commission's findings and recommendations has been largely an exercise in public participation in resource management. Of those whose thoughtful suggestions are a part of the plan, the Commission relied principally upon the Basin Governors and interim Citizens Advisory Board for expressions of public concerns. The Connecticut River Watershed Council, Inc., and the League of Women Voters Inter-League Committee on the Connecticut River Basin performed an important public service in jointly organizing a public presentation and discussion of the draft Commission report.

The degree to which the NERBC 1980 Basin plan proves responsive to public needs and preferences will ultimately convey the Commission's appreciation for the contributions of these and other individuals and organizations too numerous to mention.

Boston, Massachusetts
November 1, 1971

INPUTS
TO THE
1980 BASIN PLAN
RECOMMENDED BY THE COMMISSION

THE COORDINATING COMMITTEE REPORT

A. INTRODUCTION

Purpose and scope of study

The Connecticut River Basin Comprehensive Water and Related Land Resources Investigation is one of the original sixteen Type 2 river basin studies* selected by the Interdepartmental Staff Committee of the ad hoc Water Resources Council for completion by 1970. Authorization was provided by U.S. Senate Public Works Committee resolution, May 11, 1962. The Type 2 Connecticut river basin plan identifies water and related land resource needs and recommends measures to meet these needs, in sufficient detail to provide a basis for authorization of projects in which there is a Federal interest and for which starts are required within a ten to fifteen year period. It is intended to be a general appraisal of needs and a flexible guide to the development and beneficial use of the Basin's water and related land resources.

The investigation was a cooperative effort of Federal Agencies, the Basin States and the New England River Basins Commission, accomplished under the general guidance of the Connecticut River Basin Coordinating Committee. The Coordinating Committee was composed of representatives of the U. S. Departments of Agriculture, Army, Commerce, Health, Education and Welfare, and Interior; the Federal Power Commission; the States of Connecticut, Massachusetts, New Hampshire and Vermont; and the New England River Basins Commission (after June, 1968), and was chaired by the Division Engineer, New England Division, Corps of Engineers.

*Type 2 studies, defined by the Water Resources Council, are studies of feasibility or survey scope for individual river basins, tributary basins or subregions. They are undertaken for areas with complex problems needing concerted multiagency actions, Federal and non-Federal, for their solution. In addition to developing a water and related land resources plan to meet needs to 1980, these studies define and evaluate projects and programs in sufficient detail to comprise a basis for authorization or implementation of those projects that should be initiated in the next ten to fifteen years to satisfy urgent needs.

The Coordinating Committee report consists of an Early Action Plan considered necessary to meet water and related land resource needs by 1980 and a Long Range Plan identifying potential measures to meet needs through 2020. The Committee considered all beneficial water and related land uses in the Basin, including water quality, hydroelectric power, recreation, preservation, fish and wildlife, water supply, navigation, flood control and related land uses.

Description of the Basin

Physiography. The Connecticut River Basin is located within the Appalachian highlands of North America and is entirely within the New England physiographic province. There are approximately 11,000 square miles, or 170,000 acres of water and almost 7 million acres of land, along the 400-mile United States portion of the river; 35 percent of the Basin's land is in Vermont, 28 percent in New Hampshire, 24 percent in Massachusetts and 13 percent in Connecticut. Seventy-nine percent of the land is forested, 13 percent is agricultural, four percent is urban, and the remaining four percent is in other uses. Elevations range from sea level at Hartford and Middletown, Connecticut, in the Connecticut Valley lowland, to 6,000 feet above sea level in the northeastern mountains, which include the White Mountains and Green Mountains.

The 15 largest tributaries having watersheds larger than 200 square miles comprise an aggregate of 6,517 square miles or 58 percent of the Basin. Mean annual precipitation in the form of rain and snow averages 43 inches and ranges in extremes from 36 to 74 inches. Runoff annually averages about 23 inches, and provides for an average yield of more than 12 billion gallons per day. Average annual flow is 1.6 cubic feet per second per square mile of drainage area (cfs/m). Minimum flows of below .1 cfs/m have occurred during low flow periods in August and September. Serious floods and droughts have occurred. A maximum flow of 282,000 cubic feet per second recorded at Thompsonville, Connecticut, during the flood of March, 1936, contrasts with a minimum flow of 970 cubic feet per second during the drought of 1961-1966.

The Basin has 35 water bodies of over 500 acres and 172 ranging from 100 to 499 acres. It is a migratory route for a considerable number of waterfowl. Wide and extensive flood plains

at various reaches along the main stem become inundated to varying depths of 10 to 20 feet during major floods, and act as large detention reservoirs which significantly reduce peak discharges downstream. Available groundwater is perhaps more than one billion gallons per day, principally in the Upper Basin.

Population. Nearly 84 percent of the 1970 Basin population of 1.9 million reside south of Massachusetts' northern border in approximately four percent of the Basin area; this concentration is expected to increase to 89 percent of the projected total 2020 population of 3.1 million and to 12 1/2 percent of the land area. During 1950-1960, 86 percent of the Basin's population growth occurred in the adjoining Standard Metropolitan Statistical Areas of Springfield-Chicopee-Holyoke, Massachusetts, and Hartford, Connecticut. Little or no growth occurred in the same period from Franklin County, Massachusetts, northward. The Basin population density of about 160 people per square mile compares with a New England average of 170 and a national average of 50 people per square mile.

Economy. The Basin economy is described as stable and prosperous. Based on a diverse mixture of manufacturing, trade, finance, agriculture, tourism and higher education, it has completed a transition from an extractive to a processing economy and is currently proceeding toward a non-manufacturing service-oriented economy. Employment in the services, including recreation/tourism, medical/health, business, education, finance, insurance, real estate and other non-commodity categories, comprised 59 percent of the Basin's total employment, and is projected to increase threefold by 2020, faster than any other sector and enough to more than offset employment declines in agriculture and manufacturing. Total expenditures on recreation and tourism were over \$115 million in 1967. The Basin economy is more dependent on manufacturing than is the national economy and is projected to remain so. Manufacturing employment, however, is expected to decline from 40 percent of the total Basin force in 1960 to 33 percent by 1980 and 24 percent by 2020. While the Basin as a whole has a higher per capita personal income than the nation and is expected to rise over fivefold by 2020, only a few areas within the Basin exceed the national or New England average. The Upper Basin lies below both the regional and the national averages, while the Lower Basin lies at or above both.

Land use. The Basin's flood plains have long been the scene of the most concentrated economic growth. Projected flood plain development is explained mainly by the ease of development made possible by existing municipal services, highways, utilities, schools, hospitals, commercial and financial centers and other community facilities. Most of the readily usable land for building is in the Basin's flood plains, and it is in the flood plains that the main population centers and the industrial and commercial plants that support them have grown and will continue to grow.

Present water and related land resource development

By far the largest investment in water resource development in the Basin is hydroelectric power generation. There are more than 50 power installations of all types in the Basin with installed capacities greater than 1,000 kilowatts. Existing conventional hydroelectric developments include 47 utility plants with a generating capacity of about 620 megawatts and 28 industrial plants with a generating capacity of 24 mw. Two nuclear units are in operation with a total capacity of 785,000 kw--Yankee Atomic (185,000 kw) and Connecticut Yankee (600,000 kw).

Eighty-six percent of the Basin's population is served by municipal water supplies, compared to a national average of 75 percent. Metropolitan Hartford and Springfield account for 56 percent of the population served by municipal systems and utilize approximately 107 million gallons per day (mgd), which represents about 60 percent of the total Basin demand. There is very limited irrigation of field crops; about 95 percent of the total 14,000 irrigated acres of land in 1964 was in Massachusetts and Connecticut.

A 52-mile commercial navigation channel has been developed from the mouth of the river to Hartford, 15 feet deep at mean low water, 300 feet wide at the mouth of the river to the Lyme railroad bridge, and 150 feet wide to Hartford.

Eleven projects comprising 222,800 acres, or about three percent of the Basin's drainage area, have been completed or are under construction under the authority of Public Law 83-566 (1954), which authorizes the U.S. Department of Agriculture, jointly with State and local agencies, to check soil erosion and excessive runoff on rural land, stop destructive floods, improve

drainage conditions on agricultural land, and **develop multiple purpose** small watershed projects.

Structural measures consist of 34 single- and multiple-purpose floodwater retarding structures with 33, 000 acre-feet of floodwater and sediment storage and 2, 000 acre-feet of additional storage for water supply, recreation and fish and wildlife uses, and approximately 30 miles of channel improvement.

Less than 15 percent of the Basin's total water and land area is publicly held, but of the total of 733, 600 public acres, 306, 600 acres, or 42 percent, is National forest. The largest public holdings in the Basin are the White and Green Mountain National Forests, in New Hampshire and Vermont, respectively. State, county and municipal forests account for 410, 000 acres, or 56 percent of the public holdings.

Two hundred and seven water impoundments greater than 100 acres in size and totalling 103, 480 acres have been inventoried in the Basin. These are composed of existing natural and man-made impoundments, and are utilized for power production, recreation, municipal and industrial water supply and flood control. There are more than 200 dams in the Basin that have a minimum of 50 square miles of drainage area apiece; existing storage totals approximately 2.6 million acre-feet. Sixteen Corps of Engineers flood control and multiple-purpose reservoirs with approximately 531, 000 acre-feet of storage have been constructed under the authority of the 1936 and subsequent flood control acts, at a cost of approximately \$120 million. Three of these are in Connecticut, six in Massachusetts, two in New Hampshire and five in Vermont. The Flood Control Act of 1968 authorized planning for construction of Beaver Brook reservoir on the Ashuelot River in Keene, New Hampshire.

The Corps of Engineers has constructed 15 local flood protection works at a cost of \$30 million along the main stem and principal tributaries. The Flood Control Act of 1960 authorized planning for local protection works on the Westfield River in Massachusetts. Planning for local protection works in Park River, Connecticut, was authorized by the Flood Control Act of 1968.

The State of Connecticut enacted a statewide stream

encroachment law in 1955 to preserve natural flood storage by keeping designated flood plains free of obstructions. Massachusetts has enacted legislation to control development of coastal and inland wetlands.

B. INTERPRETATION OF PROBLEMS AND NEEDS

Assumptions. The utilization of demographic and economic projections to develop estimates of future water and related land resource needs was guided by the following assumptions derived from Senate Document 97, published in 1962:

- the timely availability of water in sufficient quantity and quality to support the projected economy;
- a high or present level of national employment and activity;
- no major depressions or wars; and
- a continuation of the current relative needs of the civilian economy and the national defense.

General conclusions. The investigation concluded that the Basin's water and related land resources are generally adequate to meet the needs projected to 1980 and 2020 and to permit the preservation of sites and open spaces needed to balance new areas of growth.

Water quality. Basin residents and industries generated a total liquid raw wasteload in 1960 equivalent to 482,000 pounds per day of five-day biochemical oxygen demand (BOD₅). Approximately 63 percent was contributed by industrial plants discharging wastes directly into the waterways. Municipalities and industries discharging wastes through municipal sewerage systems contributed the remaining 37 percent. Future untreated wasteloads are projected to increase to 1.6 million pounds per day of BOD₅ by 2020, with further concentration in the urban portions of the Basin. Approximately one percent of the Basin's wasteload is presently removed by secondary treatment. An additional 11 percent is removed by primary treatment.

Rapidly increasing uncontrolled use of fertilizer, pesticides and herbicides with resulting danger to water bodies is noted as a cause for alarm. Additional solid waste problems include surface runoff of farm animal and other wastes from

rural and urban watersheds; streambank erosion; and sludge deposits on reservoir bottoms.

The Coordinating Committee found that the present quality of the Basin's waterways precludes or impairs their use for recreation, fish and wildlife habitat, public water supply, and aesthetic enjoyment. The most immediate and pressing need is for the construction of adequate waste treatment facilities at all municipal and industrial waste sources.

Daily and hourly fluctuations in stream flow are caused by the operation of 15 major power, industrial and water supply impoundments on the main stem and by dams on many of the tributaries, in addition to natural causes. Because of the relationship of stream flow to water quality, the Committee found that low-flow augmentation may be considered as an alternative or complementary measure to advanced treatment after construction and evaluation of secondary treatment facilities in order to meet water quality standards.

Power. The Basin's energy needs in 1967 were about 10 billion kilowatt-hours, with a peak demand of about two million kilowatts. Corresponding figures for 1980 and 2020 are expected to be 23 billion and 200 billion kilowatt-hours with corresponding peaks of about five million kilowatts and 40 million kilowatts, respectively. In the New England power market area, projected 2020 power needs are more than 11 times 1967 capacity.

The operation of hydroelectric power stations for maximum peaking power production greatly alters natural stream flows. Response to power demands of the working day and into the early evening allows for hourly flow variations, while little or no flow is released throughout the balance of the day. Generally no flow is released over weekends when the demand for recreational water use is at its peak.

Recreation. Unsatisfied recreation demand, in terms of recreation days and required land and water acreage, is expected to increase substantially because of increasing population growth, per capita income, leisure time and mobility. The unsatisfied demand for recreational land and water acreage by 2020 is projected in Connecticut from 44,000 and 22,000 acres respectively to 140,000 and 69,000 acres; in Massachusetts from 56,000 and 25,000 acres to 173,000 and 80,000

acres; in Vermont from 37,000 and 13,000 acres to 159,000 and 57,000 acres, and in New Hampshire from 42,000 and 15,000 acres to 260,000 and 99,000 acres respectively. Demand-supply relationships for 1960, 1980, 2000 and 2020 in terms of activity days per summer season are projected by sub-basin in Appendix H of the Coordinating Committee report, Table H-19.

Less than four percent of Basin land is currently publicly owned. Although the Basin contains about 175 water bodies of 100 to 500 acres in size, nearly two-thirds of these are unavailable for recreational use because of insufficient access or legislative constraints. Only 61 have public access for a broad range of outdoor recreational activities.

Recreational use is permitted at certain Upper Basin water supply bodies, but is extremely limited in Massachusetts and Connecticut.

State parks and forests and Federal recreation areas are fairly well distributed but are some distances from heavy southern Basin demand centers. A large percentage of urban inhabitants cannot obtain adequate transportation to outdoor recreation facilities.

Preservation of sites. Outstanding archeological, historical and natural sites throughout the Basin are in danger of being lost without a concerted effort to provide for their identification and preservation.

Anadromous and resident fisheries and wildlife. Fishing and hunting demand is rapidly increasing. Projected fishing demand in the Basin will equal 396,200 fishermen and 6.52 million fisherman days by 1980, up from 1962 levels of 218,000 fishermen and 2.63 million fisherman days. By 2020, the figures will be 740,300 fishermen and 12.62 million fisherman days. Projected fishing opportunities show a major deficiency in the Middle and Lower Basin.

Projected 1980 hunting demand will have increased from 1.77 million man-days in 1960 to 3.1 million man-days, including 871,200 man-days of latent demand in Connecticut and Massachusetts. By 2020, total man-days will reach 4.74 million, including 1.5 million man-days of latent hunting demand. If, as trends

indicate, urban and other built-up land occupy 18 percent of the Basin's land in 2020, there will be less than 1.2 acres per man-day of hunting; making no allowance for unproductive wildlife land, the ratio of acres per hunter in 2020 will be 20 to 1, compared with a ratio of over 53 to 1 in 1960. The Committee found that there is little opportunity to create more wildlife habitat.

Atlantic salmon have nearly disappeared from the Basin with the loss of access to spawning grounds and severe pollution.

Water supply. The Coordinating Committee found that the Basin's water resources would be sufficient to meet the foreseeable in-Basin demands for domestic and industrial water supply. Municipal water supply requirements will almost quadruple during the period 1960-2020, from 178.6 mgd to 663.9 mgd. The 1980 projection is over half again as much as 1960 consumption. Per capita consumption is projected to increase 1.1 gallons per year through 1980 and .9 gallons per year to 2020. Data are not available which reflect the present safe yield of many municipal systems or a safe yield after ultimate development of the existing source. A comparison of the estimated safe yields of the municipal water systems and future demand in Table D-16, Appendix D, indicates that Basin municipal water systems in the aggregate will be inadequate to meet future demands.

Industrial water requirements, excluding the mineral and electrical industries, will rise by about 44 mgd by 1980, an 11 percent increase over 1960 requirements, and by 175 mgd or 44 percent, over 1960 requirements by 2020. The largest increase in industrial demand will occur in the Lower Basin, with increases in Massachusetts and Connecticut of 11.6 and 20.4 mgd respectively. Cooling water requirements for thermal electric generation--the largest but non-consumptive industrial water demand in the Basin--are projected to increase from 1050 mgd in 1960 to 6500 mgd in 2020.

The Coordinating Committee concluded that historic modes of developing local water supplies would be rendered inadequate in the future by the increased scale and cost of conveyance required and by competitive land use pressures. In most instances, Basin communities can meet anticipated demands without creation of regional water supply systems.

Navigation. Over 3.6 million tons of waterborne commerce were received between Middletown and Hartford in 1968, approximately 99 percent of which was petroleum products. The projected 2020 tonnage is 11.5 million tons. The existing commercial navigation channel below Hartford can handle barges of 3,000 tons capacity. Barges of 4,000 tons capacity considered more economical by the operators would require a channel depth of 16 feet with a maximum width of 250 feet between Hartford and Long Island Sound. Channel excavation and maintenance would substantially increase the average annual spoil volume of 140,000 cubic yards.

Boating activity between Long Island Sound and Hartford has doubled in the past 15 years; existing peak day traffic of 700 boats between Old Saybrook and Hartford is expected to increase to 20,000 by 2020. In the Hartford to Holyoke area, the existing peak day use of 800 boats is expected to increase to 2,400 by 2020. Almost no boating development has occurred in the free-flowing reaches, particularly in the Hartford to Windsor Locks Canal reach, because passage generally is precluded during summer weekends by low flows resulting from power dam shut-downs. Navigation locks and boating passage around several of the great falls above Holyoke are no longer operable.

Upstream water and related land resources management. Total upstream watershed flood plain acreage is estimated at 59,000 acres, of which 26,000 are in agricultural uses; 1,900 are urban; and the remaining 31,000 acres are either in forest or miscellaneous use. Average annual flood damages sustained in the 141 upstream watersheds are estimated at \$2.1 million, broken down between the four Basin States as follows: Vermont--\$0.8 million; New Hampshire--\$0.7 million; Massachusetts--\$0.5 million; and Connecticut--\$0.1 million. By 2020 seven watersheds are anticipated to have flood problems.

Heavy demands for productive crop and pasture land by other competing uses threaten the loss of desirable landscape patterns. Crop and pasture land is projected to decline from a total of 938,000 acres in 1965 to 400,000 acres by 1980 and 138,000 acres by 2020. A total of 204,000 acres of crop and pasture land need land treatment measures, including measures for erosion control, drainage, irrigation, and vegetation fertility management.

Considerable erosion occurs on intensively cultivated soils

in the Basin lowland and on steeper upland regions that are not permanently protected. Flood plain zoning and land treatment measures are needed to control the effects of flooding and urban expansion in the flood plains, including erosion and sedimentation control, and adequate vegetation cover and waterways.

Sixty-five percent of the Basin's forest land is in average or better-than-average hydrologic condition, but over one-third of the privately owned non-industrial forest land is in poor to very poor hydrologic condition. Municipal watershed management is complicated by pressures for multiple uses and by non-municipal controls over adjacent lands and waters, and in some instances is non-existent.

The proclamation boundaries of the Green and White Mountain National Forests encompass 445,000 acres within the Basin. Federal ownership within these boundaries is over 306,000 acres, leaving 139,000 acres which have not been acquired. Approximately 125,000 acres of National Forest and 110,000 acres of State forest lands produce timber below their capability because of low timber growth and quality.

Flood control and flood plain management. The existing natural average annual flood loss in the Basin, estimated at \$23.5 million (\$15.9 million main stem plus \$7.6 million tributaries), is projected to reach \$25.8 million by 1980. The projected 1980 value of the natural average annual flood loss for the 100-year period 1980-2080 is \$36.1 million.

The Coordinating Committee used a hypothetical "Standard Project Flood" (SPF), derived from a combination of severe meteorological and hydrological conditions considered reasonably characteristic of the region, to measure the Basin's flood damage potential and consequent need for added protection. The possibility of overtopping existing protective works was found to be remote. However, because the consequences of overtopping would be catastrophic, the Coordinating Committee felt that the lower portion or economic heart of the Basin needs additional flood protection designed to SPF levels.

The first comprehensive flood damage reduction plan for the Basin, approved by Congress in 1938, consisted of a system

of 20 flood storage reservoirs with 10 alternative sites to be supplemented by local protection works at the most important damage centers. The plan provided for strategic control of the tributary drainage area of the Connecticut River above Hartford, Connecticut, corresponding to approximately 25 percent of the watershed above Hartford. This criterion was used in the design of the local dikes and walls. Fourteen and eight-tenths percent of the watershed above Hartford, or ten percent less than the objective established in 1938, is considered controlled by existing reservoirs. The Coordinating Committee found that unless the remaining strategic control (approximately an additional 10 percent of the watershed above Hartford) is obtained by reservoirs, floods of lesser magnitude than a SPF could overtop existing dikes and walls and produce enormous damages and loss of life.

The principal flood damage centers on the main stem are the Hartford-Springfield metropolitan areas. Flood problems occur in communities on the tributary Passumpsic, White, Ammonoosuc, and Ashuelot river basins in New Hampshire and Vermont.

In a SPF, existing flood storage in natural flood plains along the lower main stem, principally in the reaches from Middletown to the dam at Enfield, Connecticut, and from Holyoke to Montague, Massachusetts, would amount to almost 800,000 acre-feet--a volume that is almost half again as great as the total flood control storage capacity of 532,120 acre-feet available in the existing Corps of Engineers flood control reservoirs. The Committee found that indiscriminate flood plain encroachment would increase the need for artificial storage to beyond 10 percent additional control of the drainage area above Hartford and would more than offset protection gained by reservoirs and local protection works.

Estuary. The loss of Basin coastal wetlands acreage to residential, recreational and other development is reflected in the decline of Connecticut's total coastal wetlands acreage from 23,360 acres in 1914 to 14,839 acres in 1964. In ten years, about 13 percent of the 1954 acreage was destroyed or altered so as to be no longer of value as an important element in the food chain for fish and wildlife. The estuary is closed to shellfish harvesting because the bacteriological quality of the overlying waters exceed the allowable limit.

C. PLANNING CONCEPTS AND STRATEGY

Planning objectives. The broad planning objectives set forth in Senate Document 97 have served as the basis of plan formulation for the Connecticut River investigation since its authorization in May, 1962, when Senate Document 97 was adopted. The basic objective is to provide the best use, or combination of uses, of water and related land resources to meet all foreseeable short- and long-term needs. Subsidiary multiple objectives were refined during the course of this and the concurrent North Atlantic Regional water resources study. These were national efficiency, regional development, and environmental quality. National objectives to be considered in water and related land use planning were broadened by the enactment of several new measures since 1962, principally the Public Works and Economic Development Act of 1965 and the Water Resources Planning Act of 1965.

Strategy. The Coordinating Committee report notes that the Basin economy is not dependent on water and other natural resources to the same degree that it once was and that other regions are now. Rather, a sampling of Basin residents revealed that its high quality environment attracts them to the Basin. The report also notes that any improvement in the quality of the Basin environment would make the Basin more attractive to important industrial and commercial activities; the location of a national firm in any of the Basin's smaller towns would have a far more pronounced impact on the area's economy than, for example, a new water body for recreation. A third factor noted is increasing pressure on existing public land holdings in the Upper Basin, resulting from increasing per capita recreation participation.

The Coordinating Committee's strategy for achieving the multiple objectives consists of the following three elements:

- provision of additional opportunities for resource utilization by an expanding population;
- provision of incentives for private investments; and
- provision of additional public lands, improved public access and new reservoirs for recreation to strengthen the economic base in the Upper Basin.

Evaluation of alternatives: benefit-cost analysis. An evaluation was made of the contribution of each Early Action Plan component to the Plan's net benefits. Benefits were defined, in accordance with Senate Document 97, as net gains in the value of goods and services resulting from conditions with the project compared with conditions without the project. Benefits were measured from 1980 throughout the life of the project. Future benefits were reduced to present worth and converted to an annual value at a discount of $4\frac{7}{8}$ percent.* Evaluations incorporated tangible and intangible costs. Emphasis was placed on quantitatively meeting 1980 needs.

The Coordinating Committee noted that in view of changing public attitudes toward the objectives of economic development and environmental quality, programs will have to be broadened and financial obligations reassessed, with less reliance given to benefit-cost ratios.

*Recomputations of reservoir and local flood protection works benefits at an adjusted discount rate for fiscal year 1972 are contained in Appendix A.

D. 1980 EARLY ACTION PLAN

The following pages 17-30 contain a reproduction of chapter VIII, pages 1-14, of the Coordinating Committee Main Report summarizing the Coordinating Committee's 1980 Early Action Plan.

CHAPTER VIII

COORDINATED BASIN PLAN

Section I - The 1980 Early Action Plan

The 1980 Early-Action Plan has given much attention to a balance of projects that address themselves to five principal programs and as follows:

- I Restoration
- II Preservation
- III Conservation Management
- IV Development and Management
- V Utilization and Management

The basin plan also presents a balance between programs that are structural in character, such as dams, treatment plants, walls, sewer lines, etc., and elements that are non-structural in character, such as land acquisition, easements, purchase of open space for aesthetic reasons, trails and other controls to assist in the management of water uses. The basin plan includes elements that would be accomplished through on-going Federal agency programs as well as State agency programs, together with projects that could be accomplished by the individual local municipality.

This Section presents a summary of the Early-Action Plan. It also presents a summary of the Long Range Plan which would address itself to meeting needs through the end of the projection period year 2020. Emphasis was placed on quantitatively meeting the needs and goals of the 1980 time frame. These can be accomplished by the introduction of non-structural measures, principally in the areas of preservation and by areas where management or reallocation of resources would obtain for us greater utilization of those existing projects currently in the basin, be they Federal, State or other. Structural measures for all areas of the water resource categories are also provided.

THE 1980 EARLY - ACTION PLAN

1. Non-structural Measures

A. Areas of Preservation, Conservation and Utilization

(1) Nearly 600 sites of archeological importance and more than 250 sites of either natural resource or historical importance have

been referenced in Appendix O. The Committee recommends that local interests, working closely with the State, and with assistance of on-going Federal programs take the initiative in preserving these areas for future generations.

(2) The acquisition of 69,300 acres of land within the National Forest proclamation boundaries, 4,300 acres in the White Mountain National Forest, and 65,000 acres in the Green Mountain National Forest is recommended for Federal action as delineated in Appendix F.

(3) To prevent further encroachment and reduce future damage zoning of flood plains along over 200 miles of the main stem of the Connecticut River from Saybrook, Connecticut to above White River Junction, Vermont is recommended and this action is to be coordinated with (4) and (5) below and is referenced in Appendix M.

(4) Creation of a basin wide scenic river program to preserve, protect and enhance those reaches of river identified as Wild, Scenic or Recreational is recommended. Statewide action programs will be required to implement this scenic river proposal; and in this regard, priorities for stream acquisition and management consideration by sub-basin include all or part of the following tributaries:

Sub-basin I

1. Indian Stream
2. Upper Ammonoosuc River
3. Nash Stream
4. Phillips Brook
5. Ammonoosuc River

Sub-basin II

1. Nulhegan River
2. Paul Stream
3. Moose River
4. Wells River
5. Waits River
6. Ompompanoosuc River

Sub-basin III

1. Cold River
2. Ashuelot River

Sub-basin IV

1. White River
2. Ottauquechee River
3. Williams River
4. West River

Sub-basin V

1. Millers River
2. Tully River
3. Deerfield River

Sub-basin V (cont'd)

4. Sawmill River
5. Ware River
6. Swift River (Chicopee)
7. Westfield River
8. Clam River

Sub-basin VI

1. Scantic River
2. Farmington River
3. Sandy Brook
4. Podunk River
5. Park River
6. Hockanum River
7. Ketch Brook
8. Salmon River
9. Dickinson Creek
10. Fawn Brook

Details concerning the above 35 tributaries may be found in Appendix H, and are shown on Plate K-17.

(5) The Committee recommends that streambank acquisition necessary to assure public access to basin fishery resources should be coordinated with items (3) and (4) above.

(6) To maintain aesthetic quality and to provide access and utilization, the establishment of a three-unit National Recreation Area in the Connecticut River Basin generally as described in the recommendations of the Bureau of Outdoor Recreation's "New England Heritage" is recommended and reported as follows:

(a) Federal action is required for the establishment of a three-unit National Recreation Area of 56,700 acres providing for:

- Gateway Unit, Connecticut, 23,500 acres
- Mount Holyoke Unit, Massachusetts, 12,000 acres
- Coos Scenic River Unit, New Hampshire and Vermont
21,200 acres

In addition, a 300-mile long Connecticut Valley Trail and a Connecticut Valley Tourway designed about existing roads to historic, scenic educational, industrial, archeologic and geologic points of interest, and to be a Federal-State-local cooperative effort.

(b) State action is required to complement the three-unit National Recreation Area by accomplishing the following:

- Gateway Unit: Cockaponset State Forest - expand existing holdings to form a contiguous 18,300-acre State forest.
- Mount Holyoke Unit: Mount Tom State Park - expand existing Mount Tom State Reservation adjacent to Mount Holyoke Unit to form a 4,800-acre State park.
- Coos Scenic River Unit: Connecticut Lakes State Park - enlarge existing holdings to create a 14,000-acre State Park at the northern end of the Coos Scenic River Unit.
- Moore-Comerford Interstate Park - joint development with private power company of lands surrounding Moore and Comerford Reservoirs to form a 15,400-acre Interstate Park.

(c) In addition, other State action is suggested for the establishment of

- Glastonbury Meadow State Park - 4,400 acres, and Windsor Locks-King's Island State Park - 250 acres, all in Connecticut
- Turners Falls-Northfield Mountain State Park - 31,000 acres, joint State-private power development, utilizing existing State lands and acquisition in Massachusetts
- Rogers' Rangers Historic Riverway - 27,500 acres in New Hampshire and Vermont.

Further details of the above program may be found in Appendix H and are depicted on Plate 1, Comprehensive Plan of Development.

B. Areas Where Improved Management of Existing Resources Can Help Meet 1980 Needs

The following items lie largely in the local-State areas of responsibility and interest except for the instances of Federal regulatory controls as exercised by licenses.

(1) Re-regulation of flows at existing impoundments to provide adequate minimum releases. At four power projects on the main stem of the Connecticut River, namely Wilder, Bellows Falls, Vernon, and Turners Falls, which are currently up for relicense, a minimum release of 0.2 cubic feet per second per square mile of drainage area is required. (Reference Appendix Q, Report of Subcommittee on Stream Regulation.)

(2) Continued environmental studies into the feasibility of using water supply impoundments to assist in meeting large recreational and fisheries needs as referenced in Appendix D, G, and H. The public health consequences of such action are discussed in Appendix R.

(3) Water quality studies are needed in the areas of storm and sanitary sewer separation; control or elimination of sludge deposits in reservoirs; and excessive run-off and sediment from agricultural and urban areas. Details on this requirement are referenced in Appendix Q, Report of Water Quality Subcommittee.

(4) Land treatment measures on 204,000 acres of crop and pasture land, 823,000 acres of private non-industrial forest land, 64,000 acres of National Forest lands, and watershed analysis on 306,600 acres of National Forest land and fish and wildlife surveys and analysis on 30,500 acres of National Forest land, as referenced in Appendix F.

(5) Acceleration of planning assistance to 180 towns in preparation of resource inventories, town soil reports and interpretations, and flood plain information studies. In addition, soil survey programs, involving 1.5 million acres of non-Federal lands, as referenced in Appendix F.

(6) Improved operation of flood control reservoirs. In this regard the New England Division, Corps of Engineers has established a computerized network of remote river stage data stations. These are mainly composed of river gaging stations operated and maintained by the United States Geologic Survey in cooperation with various States, and in some cases with the Corps of Engineers. This computerized network has been established in five major New

England river basins, one of which is the Connecticut. This network reports hydrologic data such as rainfall, river stages and tidal elevations from index locations on important rivers and streams, and in the tidal areas for a more timely and efficient operation of existing flood control reservoirs. The automatic hydrologic radio reporting network consists of 41 remote reporting stations, 5 recording stations, and a central control station at Division Headquarters plus 12 repeater and 4 relay sites.

The network, under computer program control, will immediately provide read-out information which is essential for flood regulation, to the Reservoir Control Center at Waltham. The reporting stations are radio-operated with principal power source supplied by batteries. The recording stations can receive data from the central control station, or individual reporting stations. The central control station at Waltham consists of an interface between the radio equipment and the computer. It will automatically interrogate the entire network or individual stations at selected time intervals and provide a complete print-out in three minutes. The hydrologic network has a capability of receiving technical data required for operation of other water resource purposes, such as low flow augmentation, recreation, water supply, navigation, and fishery enhancement. The network can be expanded to 100 stations.

Although the hydro-net system will operate continuously, its prime mission will be to focus on actual or expected flood situations. Data received is closely scrutinized and added to information received from the Corps' flood control reservoirs and other sources, such as the Weather Bureau at Boston and the River Forecasting Center at Hartford. Decisions are then made for operation of dams and instructions are radioed to operating field personnel.

(7) The Weather Bureau River Forecast Center at Hartford now provides flood forecasting service for the Connecticut River Basin. This service consists of stage and flow forecasts for the principal points along the main stem and its tributaries. Improvement and expansion of this system will be required in order to meet the needs for more detailed and accurate forecasts. Although forecasts are indispensable in saving lives and reducing property damage during floods, it is quite likely that detailed, continuous flow forecasts will prove to be even more valuable. All of the water resources management programs planned for the Connecticut River Basin - flood control, navigation, water supply, power, fish and wildlife, and even

recreation - will be more effective and more efficient when the decision makers have at their disposal a complete and accurate prediction of the behavior of the streams.

In order to achieve this degree of sophistication in streamflow forecasting, automated, detailed, real-time data on precipitation and river stages and current, and predicted reservoir releases must be available as input parameters. The Corps of Engineers network described above, as well as information from satellites and radars will be utilized in the complex reporting network. In addition, the forecasting computations will be made by computer programs. It is also anticipated that the dissemination of the forecasts to the users will be by means of data-links or other high-speed devices.

(8) Programs to inform the public of the availability of flood plain insurance and flood fighting.

(9) There is need to greatly expand current water quality monitoring and particularly at a time when so much interest and concern are being evidenced by the public for environmental quality. In order to know the effect which new improvements will have, one must have proper knowledge of what is available currently and, in many cases, gage control stations are not broad enough to deliver the types of data that are necessary to construct a basic profile of the river's environment.

The use of more sophisticated monitoring equipment at those sampling stations maintained by Federal and State agencies as well as at the additional stations proposed by the Subcommittee on Water Quality will allow for broader surveillance of the rivers' environmental condition. On going programs of many of the Federal agencies include water quality monitoring at resource facilities. For example, the Corps of Engineers regularly samples the inflows, outflows and the ponded water at its water storage projects. These samples are analyzed at its Barre Falls Dam field laboratory and the collected data are used to improve reservoir regulation for the enhancement of water quality both in the reservoir and in downstream reaches.

2. Structural Measures

In order to meet the needs determined as part of the comprehensive study it will be necessary to install considerable structural measures. A summary of these more important structural measures is detailed as follows:

(a) Public and private construction of those waste treatment facilities required to meet approved State water quality standards in the basin as delineated in Appendix D. The estimated cost of providing secondary treatment to point source pollution loadings in the basin, by State, is shown in Figure VIII-1 both for the 1980 Early Action Plan and to fulfill the potential 2020 needs.

(b) Expansion of the existing basin power supply system by private or municipal utilities to meet those power demands which will be allocated to the Connecticut River Basin, as discussed in Appendix L.

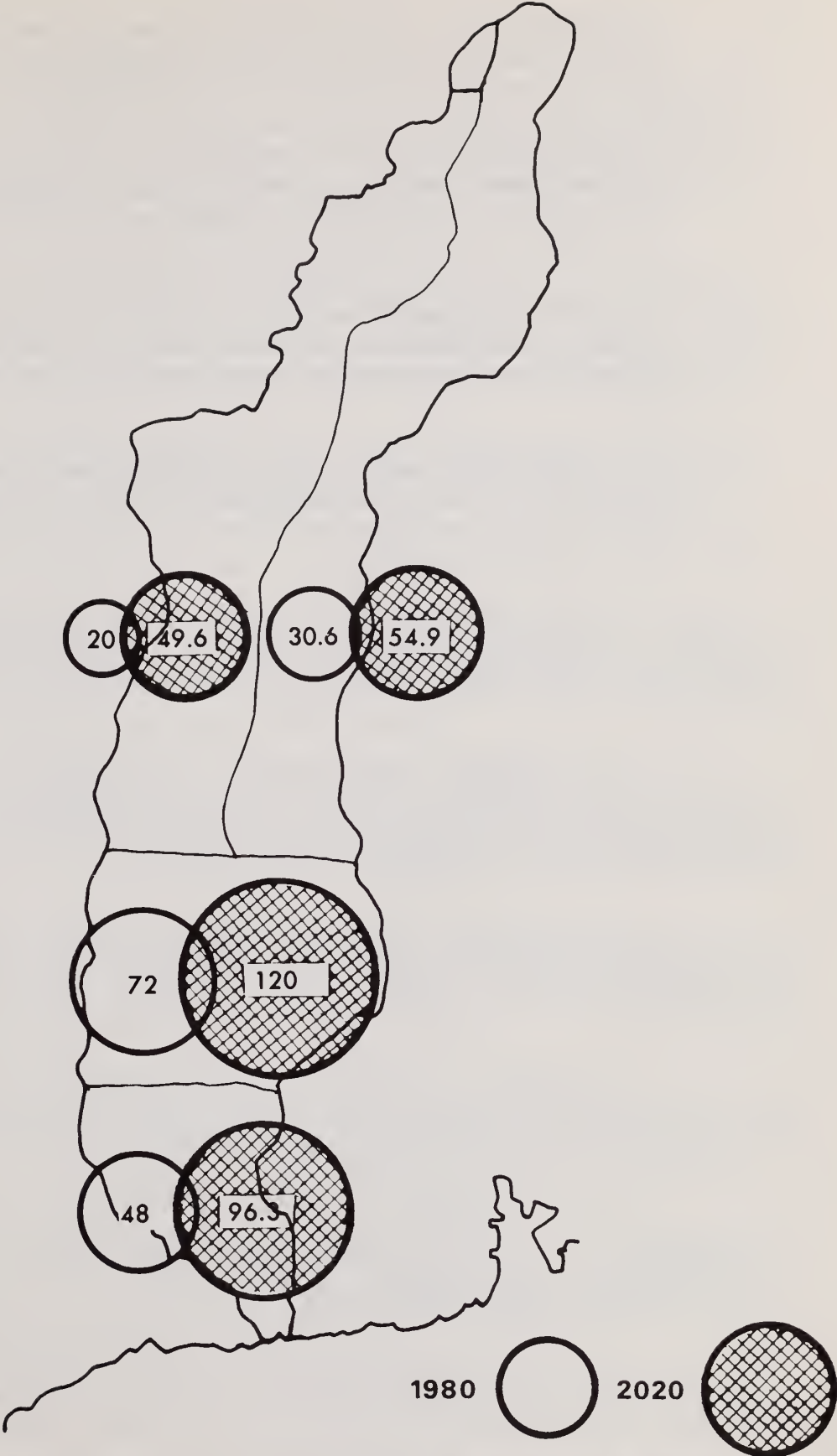
(c) Construction of seven major reservoirs in which flood control is a prime purpose. Included is one project currently in the design stage, Beaver Brook on the Ashuelot River in New Hampshire. Of the remaining six reservoirs, two, Victory on the Moose River and Gaysville on the White River, are in Vermont; three, Bethlehem, Claremont and Honey Hill on the Ashuelot River, are in New Hampshire; and Meadow is in Massachusetts on the Deerfield River. Pertinent data on these projects are reported in Table K-40 and their locations are shown on Plate K-2.

(d) Three other major reservoirs are included in the Early Action Plan. They are Gardner on the Otter River in the Millers River Basin, Massachusetts; Blackledge in the Salmon River Basin and Colebrook in the Roaring Brook Basin, Connecticut. Even though they would be constructed for purposes other than flood control, they would have some effect in reducing run-offs. Generally, pool levels would be lowered somewhat during or after late fall to allow heavy spring rains to be controlled and stored. Essentially, two of the projects, namely Colebrook* and Blackledge are required for the enhancement of fisheries and the restoration of the anadromous program in both of the tributaries where these structures are located. In the instance of the Gardner project, this particular proposal is necessary as an alternate means of meeting established State standards. The Gardner project was found to be more economical than advanced or tertiary treatment. In addition, it would provide for other multiple use purposes.

(e) Included in the plan are the modification of four existing Corps of Engineers' flood control dams by the incorporation through modification and reservoir regulation of permanent pools to include allied purposes of recreation, fish and wildlife, and water supply. The projects are discussed in detail in Appendix M.

*Also referred to in this report as "Cold Brook".

FIGURE VIII-1



ESTIMATED COST OF SECONDARY WASTEWATER TREATMENT
(IN MILLIONS OF DOLLARS)

- Knightville Dam on the Westfield River in Massachusetts, modifications to include a conservation pool for recreation and low flow augmentation to enhance fisheries.
- Union Village Dam on the Ompompanoosuc River in Vermont and contingent upon the solution to an existing water quality problem on the West Branch of the river would be operated to provide a conservation pool for recreation.
- Tully Dam on the Millers River in Massachusetts, modifications to divert water supply as part of a flood skimming operation and to establish a conservation pool for recreation.
- Barre Falls Dam and Reservoir on the Ware River in Massachusetts, contingent on solution to current water quality problem, could be operated to provide low flow augmentation during the summer months.

(f) Local flood protection projects at five locations in the basin are referenced in Appendix M, and were found necessary to complement other flood control measures in the basin plan. These are as follows:

(1) Westfield, Massachusetts - improvements to provide for 45,000 linear feet of earth dikes, about 1,500 feet of concrete floodwalls, two pumping stations, and 16,000 linear feet of channel improvement on the Little and Westfield Rivers.

(2) Lancaster, New Hampshire - a small ice retention dam and reservoir on the Israel River about one and one-half miles upstream of its mouth, together with 2,800 linear feet of channel improvement.

(3) Hartford, Vermont - improvements of ice jam flooding by excavation of reach for 3,000 linear feet of the White River from the vicinity of Hartford Bridge to the mouth.

(4) St. Johnsbury, Vermont - flood control improvements provide for 1,200 linear feet of protective earth dike and concrete floodwall, a railroad gate structure, and a pumping station located along the Passumpsic River.

(5) Park River, Connecticut - flood control improvements provide for 12,816 linear feet of conduit with headwall and pumping structure along the Park River in Hartford, Connecticut.

(g) Seventeen upstream watershed projects as referenced in Appendix F. These local projects would include 78 floodwater retarding structures of which 60 would be multiple-purpose. Eight projects, currently authorized for planning under Public Law 83-566, as amended, are as follows:

(1) West Branch, Westfield River Project, Massachusetts, comprised of 95 square miles of drainage area with 11 storage sites retained for flood prevention. Approximately 10,150 acre-feet of storage are being considered for recreation and fish and wildlife.

(2) Upper Quaboag River (supplement project), Massachusetts, comprised of 147.4 square miles of drainage area with 5 storage sites planned for flood prevention. Also being considered as part of the project are 3,900 acre-feet of storage for recreation, water quality and water supply.

(3) Wells River Project, Vermont, comprised of 99.7 square miles of drainage area with 6 storage sites planned for flood prevention. Approximately 7,300 acre-feet of storage for recreation is also being considered as part of the project.

(4) Sugar River Project, New Hampshire, comprised of 275 square miles of drainage area with 10 storage sites planned for flood prevention. Also being considered as part of the project for recreational use are 15,400 acre-feet of storage.

(5) Blow-Me-Down Brook Project, New Hampshire, comprised of 28.3 square miles of drainage area with 4 storage sites planned for flood prevention. Approximately 700 acre-feet for recreation is also to be considered a part of the project.

(6) Indian-Mascoma River Project, New Hampshire, comprised of 133.6 square miles of drainage area with 7 storage sites planned for flood prevention. About 23,000 acre-feet of storage for recreational use is also being considered a part of the project.

(7) Gale River Project, New Hampshire, comprised of 91 square miles of drainage area with 2 storage sites planned for flood prevention. Also being considered are 660 acre-feet of storage for recreational use.

(8) Indian Brook Project, New Hampshire, comprised of 2.2 square miles of drainage area with 1 storage site for flood prevention. Also 780 acre-feet of storage for recreational use is being considered.

Nine potential watershed projects are:

(1) Mill River Project, Massachusetts, comprised of 59 square miles of drainage area with 3 storage sites for flood prevention. Included is 3,800 acre-feet of storage for recreation and water supply.

(2) East Branch, North River Project, Vermont, comprised of 39 square miles of drainage area with 1 flood prevention site which include 1,600 acre-feet of storage for recreation and fish and wildlife use.

(3) North Branch, Deerfield River Project, Vermont, comprised of 50 square miles of drainage area with 5 storage sites for flood prevention. Included are 2,700 acre-feet of storage for recreation and fish and wildlife.

(4) Whetstone Project, Vermont, comprised of 28 square miles of drainage area with 5 storage sites for flood prevention. Included are 5,600 acre-feet of storage for recreation and fish and wildlife.

(5) Bali Mountain Brook Project, Vermont comprised of 35 square miles of drainage area with 2 sites for flood prevention. Included are 4,000 acre-feet of storage for recreation and fish and wildlife.

(6) Black River Project, Vermont, comprised of 195 square miles of drainage area with 3 sites for flood prevention.

(7) Passumpsic-Moose Rivers Project, Vermont, comprised of 374 square miles of drainage area with 8 sites for flood prevention. Included are 13,300 acre-feet of storage for recreation and fish and wildlife.

(8) Upper Ammonoosuc River Project, New Hampshire comprised of 254 square miles of drainage area with 3 sites for flood prevention. Included are 43,200 acre-feet of storage for recreation, water quality and water supply.

(9) Mohawk River Project, New Hampshire, comprised of 56 square miles of drainage area with 2 sites for flood prevention. Included are 10,000 acre-feet of storage for recreation.

(h) Completion under Public Law 89-796 of four resource conservation and development projects having substantial land areas within the basin (referenced in Appendix F), as follows:*

(1) North Country Resource, Conservation and Development Project comprised 1,201,700 acres in Coos, Grafton, and Carroll Counties of New Hampshire.

(2) East Central Vermont Resource, Conservation, and Development Project encompassing 23 towns in parts of Orange, Windsor, Rutland, and Addison Counties.

(3) Berkshire-Franklin Resource, Conservation and Development Project, with some 600,000 acres included in the basin in Massachusetts.

(4) Eastern Connecticut Resource, Conservation, and Development Project including 26,000 acres in Tolland and New London Counties.

(i) Other select upstream impoundments, for purposes other than flood control; 118 dam sites in total as referenced in Appendix F.

These 118 sites would have a total storage capacity of 463,000 acre-feet, of which 68,000 acre-feet would be for floodwater and sediment, 156,000 acre-feet for recreation, 111,000 acre-feet for fish and wildlife, 108,000 acre-feet for low flow augmentation, and 20,000 acre-feet for public water supply. A total of 18,200 acres of water surface area and flow augmentation benefiting 467 miles of downstream fishery would result from these impoundments.

(j) Structural developments on National Forests lands (referenced in Appendix F), as follows: recreation facilities on 555 acres; recreational impoundments amounting to 310 surface acres; 255 miles of roads and trails; 37 fire control heliports; 37 acres of fish and wildlife improvements.

(k) Navigation improvements are needed and are described in Appendix L. They provide for:

*See page S-6 for a statement of this recommendation corrected by the U. S. Soil Conservation Service.

(1) Deepening and widening the present commercial navigation project from Saybrook Light to Hartford, Connecticut.

(2) Construction of a 32-mile recreational navigation project from Hartford, Connecticut to the vicinity of the Willimansett Highway Bridge below Holyoke, Massachusetts.

(3) Recreational navigation improvements on the main stem of the Connecticut River behind the Holyoke, Turners Falls, Vernon, and Bellows Falls power dams.

(1) Construction of fish hatcheries, as well as fish ladders to meet requirements of resident and anadromous restoration programs.

SUMMARY

THE 1980 EARLY ACTION PLAN

1. Non-Structural Category

A. Preservation, Conservation and Utilization

- (1) Historical and Archeological
- (2) Forested Land
- (3) Flood Plain Zoning
- (4) Scenic River (35)
- (5) Streambank Acquisition
- (6) BOR Plan, Fed-State

B. Improved Management

- (1) Re-regulation
- (2) Use of Water Supply Bodies for Recreation
- (3) Water Quality - 5 Areas
- (4) Land Treatment Measures
- (5) Technical Planning Assistance
- (6) Improvement and Expansion of Flood Warning System
- (7) Flood Plain Insurance and Flood Fighting
- (8) Water Quality Monitoring Programs

2. Structural Category

- (a) Waste Treatment Plants
- (b) Expand Existing Power
- (c) Construct 7 Major Dams (F. C.)
- (d) 3 Other Large Dams
- (e) Modification at 4 Corps Dams
- (f) Local Protection at 5 Areas
- (g) 17 Upstream Watershed Projects
- (h) 4 RC & D Projects (see p. 29)
- (i) 118 Upstream Sites
- (j) Improvements on National Forest Lands
- (k) Navigation - 3 Projects
- (l) Fish Hatcheries and Ladders

Costs. The total cost of the Early Action Plan including private investment in power production is estimated at \$1.8 billion, allocated by purpose as follows:

water quality	\$259 million
power	\$700 million
recreation	\$253 million
preservation of sites	(estimate not possible)
anadromous fisheries	
restoration	\$ 29 million
resident fish and wildlife	\$ 65 million
water supply	\$207 million
navigation	\$ 12 million
upstream watershed and	
related land management	\$ 84 million
flood control	<u>\$173 million</u>
	\$1.8 billion

Implementation. The Coordinating Committee recommended:

- that the Early Action Plan be accepted and used as a guide for the development and beneficial use of the water and related land resources of the Connecticut River Basin;
- that its report be used as a supporting document for the individual agency reports which would be the basis for authorization of the various parts of the plan, with particular reference to areas where Federal cost sharing requires Congressional authorization;
- that there be established within the New England River Basins Commission a Connecticut River Basin Program to coordinate planning in the interest of a balanced management of water and related land resources; and
- that a program be initiated to make the public more effective participants in the planning process.

Early Action Plan priorities and schedule. The Coordinating Committee recommended as a minimum that all current needs be met and at least 50 percent of all 1980 projected needs. Emphasis was placed on investments intended to restore severely

violated natural resources and on land acquisition intended to prevent competing uses from precluding needed future development. It was recommended that the following measures be undertaken first: water quality improvement; land acquisition-- particularly acquisition of proposed reservoir sites; flood control; emergency flood control planning; and flood plain zoning.

TOTAL COST \$1.8B

WATER QUALITY

1. Secondary Level Treatment for 1980	\$ 240M
2. Advanced Waste Treatment for 1980	19
3. Others (Costs not available)	
Low Flow Augmentation	
Combined Sewer Separation	
Uncontrolled Runoff	
Diversion of Wastewaters	
Bottom Deposits	
Cost	\$ 259M

WATER SUPPLY

1. Northfield Mt. Diversion	\$ 60M
2. Expansion of Municipal and Industrial Supplies	125
3. Corps' Reservoirs	19
Beaver Brook	
Tully	
4. Upstream Reservoirs	3
Cost	\$ 207M

ANADROMOUS RESTORATION

1. Fish Ladders at Five Existing Power Dams	\$ 13M
2. Construction of New Fish Hatchery Facilities	7
3. Streambank Acquisition	5
4. Provision of Reservoir Flow Releases	4
Cost	\$ 29M

RESIDENT FISH AND WILDLIFE

1. Improved Access at Existing Water Bodies (approx)	\$ 3M
2. Provision of New Water Bodies	37
Corps' Reservoirs	12
Other Upstream	23
Reservoirs	
3. Expansion of Hatchery Facilities	5
4. Extensive Streambank Acquisition Program	20
Cost	\$ 65M

POWER

Installed Capacity	3,660 megawatts
1. Conventional Hydro	\$ 50M
2. Pumped Storage Hydro	210
3. Int. Combustion/Gas Turbine	40
4. Nuclear-fueled Steam	400
Cost (private sector)	\$ 700M

FLOOD CONTROL

1. Corps' Dams	
Victory	\$ 2
Bethlehem Junction	5
Clayville	23
Claremont	10
Seventeen Upstream Watershed Projects	1
3. Other Upstream Dams	
4. Five Local Protection Projects	25
5. Flood Plain Regulation (estimate not possible)	11
Cost	51
	\$ 173M

OUTDOOR RECREATION

1. Expansion of Existing Water Bodies	\$ 10M
2. Construction of New Water Bodies	93
Corps' Reservoirs	\$55
Other Upstream	28
Reservoirs	
3. National Recreation Area Plan	120
4. Wild and Scenic Rivers	25
5. Modification of three existing Corps' Reservoirs	5
Cost	\$ 253M

NAVIGATION

1. Long Island Sound to Hartford	
Commercial project	\$ 4M
2. Hartford to Holyoke	
Recreation project	7
3. Improvements in Main Stem Power Pools, etc.	1
Cost	\$ 12M

UPSTREAM WATER AND RELATED LAND RESOURCE MANAGEMENT

1. Land Resource Planning	\$ 3M
2. Land Treatment	33
Private Lands	\$31
National Forests	\$2
3. Resource Conservation and Development Projects	24
4. National Forest Structural Improvements	15
5. Land Acquisition for National Forests	9
Cost	\$ 84M

PRESERVATION OF SITES

1. Archeological	
2. Historical	
3. Natural Resource	
Cost	
* Estimate not possible	*

1980

EARLY ACTION PLAN

CONNECTICUT RIVER BASIN

E. 2020 LONG RANGE PLAN

The following pages 35-40 contain a reproduction of chapter VIII, pages 40-45, of the Coordinating Committee Main Report summarizing the Coordinating Committee's 2020 Long Range Plan.

CHAPTER VIII

Section 4 - The 2020 Long Range Plan

The "Long-Range Plan" presents an identification of potential means for meeting needs of the 2020 time period. These potentials would be studied in more detail and brought to the attention of local interests some time after 1980 or as the long-range needs appear to materialize. Future studies or technological innovations may indicate needs other than those identified below that would warrant considerations.

Several of the elements in the 2020 Plan are extension or expansions of those found in the Early Action 1980 Plan.

1. Non-structural Measures

A. Areas of Preservation, Conservation and Utilization

(1) As population expands a more concerted government and private effort will be needed to preserve sites of archeological, historical or natural importance.

(2) There should be a continuing expansion of flood plain management programs particularly on tributaries to the Connecticut River, to prevent further encroachment on flood prone areas and reduce future damage.

(3) As programs are established in regard to early action recommendations for recreation resources, and as other public and private actions develop, basin's resources and the region's socio-economic characteristics will change. A continual program should be established to facilitate early action recommendations to monitor basin resources and socio-economic characteristics and to establish new priorities.

(4) The Streambank acquisition program necessary to assure increased public access to the basin's fishery and recreational resources, will need to be expanded to other tributary areas as determined by future studies.

B. Areas Where Improved Management of Existing Resources Can Help Meet 2020 Needs

(1) Re-regulation - All power of each utility in the Basin should be included under a single license. A minimum flow formula,

such as the 0.20 cfs per square miles of drainage recommended in the Early Action Plan, should be applied through appropriate procedures to all power storage and generation projects in the Connecticut River, with provisions of periodic review and adjustment. Under this review procedure, the advisability of reallocation of existing storage to other purposes should be considered. This is particularly relevant to existing power storage reservoirs if conventional hydroelectric generation becomes outmoded or otherwise discontinued. (Reference Appendix Q - Report of the Stream Regulation Subcommittee)

(2) Land Treatment and Management - Land treatment for target year 2020 will be needed on an additional 3.6 million acres composed of 50,000 acres of crop and pasture; 3.4 million acres of private, non-industrial forest land; and 150,000 acres of urban and other land. (Reference Appendix F.)

(3) Land Resource Planning - By target year 2020, soil surveys need to be completed on an additional 3 million acres and an additional 188 towns in the basin will need assistance in resource planning (Reference Appendix F.)

(4) Water Quality - Additional and continuing assessments are needed in the areas of combined sewer and storm water overflows, as well as eutrophication, sludge deposits, pesticides, land drainage and erosion.

Incentives and regulations should be initiated to encourage redesign of present plant processes, recovery processes, pre-treatment measures and land use practices that could substantially reduce the volume of effluent and the effect of discharged wastes.

(5) Water Quality Monitoring Programs - As the population and need for water supply increases, there will be a continuing need to expand water quality monitoring programs, particularly as less desirable watersheds are utilized. Ideally, cooperative monitoring programs including local, State, academic and Federal agencies involved in water quality monitoring should be undertaken in order to minimize duplication of effort, to take advantage of special capabilities, and to reduce cost.

2. Structural Measures

A. Water Quality

Under the pressures of future population and industrial expansion, abatement of pollution and the control of its effects must

receive continuing evaluation. Facilities will have to be enlarged and controls above basic secondary treatment will likely be required in certain areas of the basin if water quality standards are to be maintained. Regional treatment facilities should also be considered. As noted in Appendix D, the capital cost of providing basic minimum secondary water pollution control facilities sized to meet the 2020 projected waste load is estimated at \$321 million and does not include operation and maintenance charges, nor the construction cost of interceptors, pumping stations and collection systems.

Controls above secondary treatment, through complementary actions, including advanced waste treatment and/or flow augmentation, are available and could be provided to assure desirable basin development. In the absence of other supplemental measures, the capital cost of providing advanced waste treatment for the year 2020 is estimated at slightly over \$54 million. Of particular note is that the present worth of operation and maintenance for advanced waste treatment computed on a 25-year life of project would cost \$111 million.

As the total impact of the planned treatment program on water quality is felt, problem areas that may emerge will be corrected in the light of future growth patterns and technology on a case by case basis. In addition, new water quality advances will be initiated. The process is likely to be a continuing one requiring periodic re-evaluation of the standards; further technical investigations on such matters as combined sewers, overland drainage controls and further treatment arrangements; and a constant awareness of the close relationship between water quality, water use and land use.

B. Power

Assuming a similar rate of growth as the New England power market, basin energy requirements may be expected to climb from 23 billion kilowatt hours in 1980, to 200 billion kilowatt hours in 2020. Corresponding capacity needs would increase from 5 million kilowatts in 1980 to 42 million kilowatts in 2020. On this basis, it is estimated that Basin demands in 2020 will be more than the basin available economic supply.

If present trends continue then 2020 power needs will likely be met, in large part, by nuclear-fueled base load plants and pumped storage peaking plants. Fossil-steam output would decline until the turn of the century, while conventional hydroelectric generation

would increase moderately. While the general location of fossil and nuclear steam units is fairly well defined in the basin through 1990, beyond that time siting becomes very speculative. At this time, however, it seems that the larger baseload plants of the future will most likely be developed on the main stem of major waterways, the estuary reaches of major streams, on the shores of large inland water bodies or along the coast.

Appendix I lists 25 conventional hydroelectric units which have potential for future development, as well as 10 pumped storage sites which could be used to meet future peak power demands.

C. Water Supply

Future demands will likely necessitate the development and use of water supply resources not hitherto utilized. Because of the generous yield from the basin's streams and aquifers, no serious problems with respect to future demand are anticipated. Direct stream withdrawal with necessary treatment, may be used in areas where groundwater or reservoir sources are not competitive or available.

In some cases, the growth of certain municipalities may be curtailed where the pattern of local water supply systems continues and the locality is in a tributary headwater reach. These problems could, however, be surmounted by adequate regional planning. One factor which may have a bearing on future water supply demands is the interrelationship between costs of waste treatment and use of water. For example, industries may reduce their use of process water to keep down the cost of waste treatment. (Reference Appendix D.)

D. Flood Control and Allied Purposes

(1) Potential Upstream Watershed Projects - By the year 2020 seven watersheds comprising 667, 000 acres in the basin are anticipated to have flood problems and other water resources needs. To meet this requirement, seven Public Law 566 projects, containing 38 structures have been identified as having a capability of 217, 000 acre-feet of water storage potential available for multiple-purpose use. The seven projects which are described in Appendix F and shown on Plate K-16 would be located as follows

- a. Ottauquechee River, Vermont
- b. Williams River, Vermont
- c. Saxtons River, Vermont

- d. West River, Vermont
- e. South River, Massachusetts
- f. Scantic River, Massachusetts & Connecticut
- g. Coginchaug River, Connecticut

(2) Local Protection Projects - Appendix M states that "No need is foreseen for major structural flood control measures beyond what has been recommended in the 1980 plan. However, as population increased and urban centers become more concentrated, communities which continue to build in the flood plain are likely to need local protection. Out of the many local protection sites investigated by the study, 7 are considered as potentials for target year 2020."

2020 LOCAL PROTECTION POTENTIALS

- | | |
|----------------------------|---------------------|
| a. Groveton, New Hampshire | (Connecticut River) |
| b. Lebanon, New Hampshire | (Mascoma River) |
| c. East St. Johnsbury | (Moose River) |
| d. Ludlow, Vermont | (Black River) |
| e. Windsor, Vermont | (Connecticut River) |
| f. Bellows Falls, Vermont | (Connecticut River) |
| g. Brattleboro, Vermont | (Connecticut River) |

F. Navigation

In 1968 nearly 3.7 million tons of commerce were handled by the existing Long Island Sound to Hartford navigation improvement. Projecting the trend of the most recent 10 year's period indicated that by the year 2020 facilities will be needed to handle 11.5 million tons of cargo. In addition to commercial requirements, at present, approximately 3,500 boats make up the recreational boating fleet moored or berthed on the river below Hartford. Considerable growth is anticipated in recreational boating and provisions will be needed from both private and public sectors for handling a greatly enlarged fleet in future years.

The boating pressures above Hartford will likely accelerate particularly with the effective implementation of the pollution abatement and improved flow regulation and flow augmentation programs recommended in the 1980 Basin Plan. Boating passage may be required at main stem dams up to and including Bellows Falls. Passage could be accomplished by either marine railway or navigation locks depending on traffic density. Aids to navigation will be needed to identify safe channel sections in the pools associated with the Holyoke, Turners Falls, Vernon and Bellows Falls power dams.

G. Fish Hatcheries and Ladders

By 2020 recreational use of the Basin's resources for fishing could increase to over 12 million fisherman days or almost five times the present demand. This need could be met by a continuation of the following:

- (1) Creation of new reservoir fisheries
- (2) Restoration and expansion of anadromous fisheries
- (3) Enhancement of stream fisheries
- (4) Abatement of pollution
- (5) Provision of access
- (6) Establishment of low flow augmentation schedules

H. Multiple-purpose Reservoirs

The Coordinating Committee has identified nine multiple-purpose large category reservoirs which could be utilized to alleviate an array of 2020 water resource needs. These are reported in Appendix K and are shown on Plate 1 of this report include the following:

<u>Site</u>	<u>Tributary Basin</u>
1. Indian Stream	Indian Stream, New Hampshire
2. Upper Jefferson	Israel River, New Hampshire
3. Hammond Hollow	Ashuelot River, New Hampshire
4. Falls River	Falls River, Massachusetts
5. Fort Morrison	Deerfield River, Massachusetts
6. Natty Pond Brook	Chicopee River, Massachusetts
7. Prince River	Chicopee River, Massachusetts
8. Lower Bisbee	Westfield River, Massachusetts
9. Sandy Brook	Farmington River, Massachusetts

In addition there are a number of small upstream water impoundments sites which do not conform to the requisites of Public Law 566. Sixty-three in this category were identified for their potential to meet future storage needs, although allocation of specific storage purposes was not made. These are also described in Appendix F and show on Plate K-16.

RESPONSE
TO
THE NEW ENGLAND RIVER BASINS COMMISSION
ON
THE COORDINATING COMMITTEE REPORT

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Synopsis

The Coordinating Committee report was generally accepted as a flexible guide for future Basin planning. Where opposition was expressed to specific recommendations, these were usually recommendations for structural measures having an as yet undetermined environmental impact. Proposals for which there was general support had important environmental benefits or acceptable environmental costs. This input to the Commission's report therefore consisted of a set of proposals considered environmentally essential, or at least safe, by the reviewers, such as waste treatment plants, preservation of sites and flood plain zoning, and a set of proposals, such as power plants and impoundments, accompanied by important environmental cautions.

The principal criticisms were that the report inadequately evaluated alternative measures and understressed environmental quality in relation to economic development planning objectives; that too much emphasis was given to structural as opposed to nonstructural solutions; that insufficient evidence was presented supporting the need for new reservoir development to meet a broad range of upstream and downstream resource needs; and that primary attention in future Basin planning should focus on nonstructural methods of flood plain management, such as flood plain acquisition and zoning, with substantial Federal assistance.

Review procedure

The 90-day review of the Coordinating Committee report was carried out in compliance with section 204 of the Water Resources Planning Act of 1965, which governs the preparation, adoption and transmittal of comprehensive, coordinated joint plans for the water and related land resources of river basins by river basins commissions. The Water Resources Council established November 1, 1970 - January 31, 1971, as the prescribed 90-day review period.

The review procedure served three basic purposes: it complemented technical judgments of the Coordinating Committee with political and social concerns of the Basin States; it incorporated public judgments in the evaluation of resource management alternatives recommended by the Commission; and it provided for a

departmental level critique of the Coordinating Committee's recommendations which were made at field level.

Participants in the political process, by which the Basin's resources are allocated to different uses, have had an opportunity to participate in the Basin planning process by commenting on the Coordinating Committee and draft Commission reports. Comments on the Coordinating Committee report, which are summarized below, were addressed to the Commission by the Basin Governors; by heads of Federal departments and agencies and interstate agencies represented on the Commission; by the International Joint Commission; by a Citizens Review Committee (CRC) organized by the Commission; and by the public at large. The Commission's response to all comments is described in the following section.

The findings and recommendations of official and unofficial reviewers accompany the 1980 Basin plan transmitted to the Water Resources Council and to the Basin States. These are arranged in the order in which they were received and are transmitted as a separate document, appended to the plan by reference. The CRC report has been published and distributed as a separate document and is also appended by reference.

Comments on the environmental impact statement prepared by the Coordinating Committee are not included in the following summary. The statement and the comments have been taken into account and are appended by reference to the 1980 Basin plan.

Comments on study purpose, scope and organization

The report was generally accepted as a flexible guide to future resource planning and development in the Basin. The Basinwide scope of study was accepted as logical and necessary. However, Governor Davis of Vermont cautioned that "to extend this concern and propose that the resources of the Upper Basin must be manipulated to satisfy all social desires of the Lower Basin residents ignores political, social and financial realities." The study's contribution to coordination among the many resource planning and development interests in the Basin was recognized, but it was noted that coordination among study participants had been impeded by several factors, including uneven levels of Federal agency and State funding.

Comments on the interpretation of problems and needs

Guiding assumptions for future Basin development were said to be based solely on population data rather than on considerations of environmental quality.

Comments on planning concepts and strategy

It was commonly found that environmental quality was understressed among the multiple planning objectives, and that nonstructural measures and qualitative benefits and costs were understressed in the evaluation of alternatives, which had a heavy economic orientation. It was acknowledged that the investigation had been conducted under planning objectives that were applicable at the time; nevertheless, Governor Sargent, for example, indicated that further implementation of the report in Massachusetts would be guided by increased concern for the preservation of the environment, as expressed in the National Environmental Policy Act of 1969.

Comments on water quality

The recommended achievement of State-Federal water quality standards was strongly supported. Low flow augmentation was strongly opposed where waste treatment methods might prove feasible. The Environmental Protection Agency and CRC agreed on the preliminary nature of the evaluation of flow augmentation requirements for water quality control and on the need for further assessment before commitments are made.

Comments on power

Recommendations for power development and minimum flow releases received general support. Governor Sargent expressed concern with the environmental impact of steam electric and pumped storage plants "wherever they may be located," and specifically opposed freshwater siting of nuclear plants. The Federal Power Commission encouraged consideration of power generating opportunities in project planning for a variety of purposes.

Comments on outdoor recreation

The Bureau of Outdoor Recreation's plan for a Connecticut River National Recreation Area was generally given high priority. Several other elements of the outdoor recreation portion of the Early Action Plan were questioned. Governor Sargent considered it unrealistic to attempt to accomodate projected boating demand to any great extent by the creation of several new impoundments. Governor Davis questioned the need for "irreversible actions" to meet recreational needs, which he preferred to look upon as "desires" rather than "needs." There was support for the Coordinating Committee's recommendation for further study of the feasibility of using water supply reservoirs for recreational purposes. CRC found that "the recreational values that can and should be realized in the Basin go well beyond those recognized by the Plan." The report was criticized for failing to treat urban recreational needs.

Comments on preservation of sites

The Coordinating Committee's recommendations concerning the preservation of archaeological, historical and natural resource sites in the Basin received strong support.

Comments on the restoration of anadromous fisheries

This program was supported, although Governor Davis preferred to see it presented "more in light of restoration of a resource, rather than justified in terms of economic exploitation." The Federal Power Commission indicated that recommendations concerning fish passage facilities at licensed main stem power dams were being considered by Commission staff.

Comments on fish and wildlife

Governor Davis and CRC recommended further research on the effects of impoundments on fish and wildlife habitat.

Comments on water supply

The Bureau of Domestic Commerce questioned the Committee's methodology for projecting municipal and industrial water supply needs on several points, among these the assumed portion of total water demand that would be satisfied through development of groundwater supplies. CRC recommended accelerated efforts to locate, evaluate and protect groundwater sources. Some concern was expressed with the legal implications of water supply diversions, or "flood skimming." CRC recommended that diversion out-of-the-Basin be conditioned upon: a regional mechanism for allocation of water; proper monitoring of diversion volumes and reporting to an independent authority such as the Commission; also the possibility of establishing a quid pro quo such as expanding recreation on Quabbin reservoir in return for that reservoir's receiving surplus Connecticut River waters. CRC also urged study of the desirability of using part of any such "excess" water for flow augmentation within the Basin and for water supply to downstream metropolitan areas in the Lower Basin.

Comments on navigation

The Department of Transportation expressed general satisfaction with the plan for navigation improvements. CRC opposed commercial navigation channel enlargement below Hartford until its environmental impact could be evaluated. Governor Dempsey expressed reservations about the impact of recommended recreational boating improvements above Hartford on the Windsor Locks Canal, which, he said, "must be recognized as one of the unusual sites for preservation as recommended by Element 4 of the study."

Comments on upstream water and related land resources management

Several reviewers questioned the justification and overall ecological impact of small upstream impoundments. CRC expressed uncertainty on how these projects fit into the overall Basinwide flood control program. CRC strongly supported implementation of the Coordinating Committee's recommendations for accelerated conservation education, in the belief that implementation of the Basin plan depends on public understanding of natural resources management.

Comments on flood control and multiple purpose reservoirs

The bulk of the comments received concerned the Coordinating Committee's proposals for construction of large multiple purpose reservoirs. CRC provided a close analysis of the Committee's overall rationale and recommendations for specific reservoir development. For the most part, the Governors commented on reservoirs that would be located in their states.

CRC found that the reservoir proposals were based on inadequate evaluation of alternative--principally nonstructural--measures and inadequate consideration of environmental impact. CRC and others questioned the report's evaluation of flood damage risk; the probabilities and impact of major storms; the concept of a Standard Project Flood; and the objective of controlling 25 percent of the watershed above Hartford. CRC recommended "as a matter of immediate priority" that NERBC restudy the need for new flood control reservoirs and long-term benefits and costs of alternative means of flood protection.

Victory and Gaysville reservoirs in Vermont were opposed by Governor Davis. Governor Peterson of New Hampshire withheld comment on the Early Action Plan until New Hampshire's priorities could be assessed. The Department of the Army recommended that, in light of Congressional deauthorization of Claremont reservoir in New Hampshire, alternative measures be more fully discussed. Governor Sargent opposed authorization of Meadow dam "unless a very thorough and unbiased ecological impact study was conducted." The Environmental Protection Agency stressed that a decision has not been made that flow augmentation is needed for water quality control purposes "in certain new reservoirs, e. g., the Gardner project on the Otter River," and recommended more detailed analysis of alternatives for meeting water quality standards "in such instances where the preliminary analysis has indicated that flow augmentation may be warranted." Governor Dempsey and his successor, Governor Meskill, indicated that Connecticut would give the proposed Blackledge and Cold Brook reservoirs in Connecticut "grave and careful consideration." CRC strongly supported the Coordinating Committee's recommendation that proposed reservoir sites be acquired, "with a total prohibition of any development that could inhibit future implementation of river basin study proposals."

The compatibility of proposed reservoirs' multiple benefits was questioned. CRC, for example, felt that flood control, water supply, flow augmentation and recreation within a single reservoir "are all competing and probably in the long run mutually exclusive uses." Participants in a symposium of concerned scientists, organized for CRC, and several town conservation commissions in Massachusetts opposed reservoir construction; it was principally argued that the reservoirs' main purpose would be flow augmentation, which would cause serious problems of erosion and sedimentation and otherwise seriously damage the "riparian eco-system". Governor Davis agreed that assumed low flow augmentation benefits of new impoundments need careful study to evaluate ecologic effects.

Governors Dempsey and Davis disagreed on the need for new large flood control reservoirs to protect downstream development in the flood plain. While Governor Dempsey hoped that the report would "allow our upstream neighbors to approve such projects as have mutual benefits," Governor Davis found that

No other area of activity raises more concern today than...the impoundment of waters...A fundamental issue to be resolved is the wisdom of additional construction of flood control structures without adequate control over continued development of the flood plain.

Governor Davis and CRC pointed out that Federal flood control policy, in an apparent inconsistency, declares flood protection to be primarily a Federal responsibility while leaving primary responsibility for flood plain management to the States and municipalities. According to CRC,

This is in effect a subsidy, an increase in value to individuals and local communities because the Federal government seemingly underwrites risks of flooding at little or no cost to the beneficiaries. The result is that the Federal government is subsidizing and encouraging flood plain development...CRC fears that 'flood control' as now practiced, without effective flood plain management, tends to be self-perpetuating and self-expanding.

Some reviewers felt strongly that the Federal government should assume a broader responsibility for flood plain management, rather than limit itself to the more narrowly construed concept of "flood control." Governor Davis, for example, suggested Federally-assisted flood plain acquisition where a dual purpose of recreational use and flood protection is achieved. CRC agreed on the need to modify existing Federal programs to permit Federal acquisition of flood plains, especially where recreational opportunities and open space could be provided near urban areas.

It was felt that the report provided insufficient information to permit an evaluation of nonstructural flood control alternatives. The Department of Housing and Urban Development devoted the body of its review to a proposed outline for an additional study of nonstructural measures. CRC argued that "any rational Basin plan must provide for effective flood plain management as an integral part of the plan, and any construction of dams large or small should be based on the need with reference to and in conjunction with accomplished flood plain zoning."

Comments on the estuary

The Department of the Interior felt that the report should have addressed problems and needs in the estuary in greater depth.

Comments on the Connecticut River Basin Program

The Coordinating Committee's recommendation for a Connecticut River Basin Program received a positive response. Some concern was expressed with prospects for program funding, and the Commission was urged by CRC to seek "really adequate financial resources for the Connecticut River Basin Program." CRC stressed the importance of the Coordinating Committee's recommendation to create a Citizens Advisory Board as part of the Program.

Comments on priorities

Because of the magnitude of present needs, particularly water quality, the Department of the Army recommended that the Commission present 1980 program priorities or schedules in its report. CRC gave highest priority to flood plain management

"for effective long-term flood damage control," and recommended a restudy of flood management alternatives as its second priority. Other items to which CRC gave highest priority were, in order: acquisition of lands which will be utilized in the Basin plan; ecological impact analyses; development of waste treatment systems; minimum flow releases; and the establishment of the Connecticut River Basin Program. Governor Davis emphasized that although planning needs were considered in overall Basinwide context, evaluation, priorities and implementation at the State level must be in terms of total State needs and priorities.

RESPONSE TO THE DRAFT FINDINGS AND RECOMMENDATIONS
OF THE
NEW ENGLAND RIVER BASINS COMMISSION

Synopsis

Comments: The consequences of major environmental alterations were a predominant concern in the response to the draft 1980 Basin plan recommended by the Commission. It was generally agreed that such alterations should be conditioned upon satisfactory completion of environmental impact evaluations. However, a central issue was whether the necessary evaluations would require the development of a detailed ecological inventory and predictive model pertinent to all resource decisions for the entire Basin. The Commission was urged to pursue the objectives of the proposed Basinwide environmental reconnaissance beyond the scope, authority and funding limits established in task one of the supplemental study program. Some felt that without a detailed Basinwide ecological model, there are inadequate grounds for recommendation of the plan in part or in its entirety. Suggested modifications of the plan included further environmental impact evaluations of power, water diversion, navigation and flood management projects. Lower Basin communities expressed particular concern for the protection of riparian rights in the implementation of projects to divert water from the Basin to meet out-of-Basin water supply needs.

Commission response: The Commission has significantly modified the draft 1980 Basin plan in response to the comments received. It is emphasized, however, that the plan in final form represents the Commission's judgment concerning resource management needs of the Basin as a whole, rather than the individual or combined judgment of participants in the field level investigation, in the review of the Coordinating Committee report or in the review of the Commission's draft report.

All major environmental alterations are conditioned on "satisfactory completion" of environmental impact evaluations. The Commission now stipulates that environmental evaluations will be considered "satisfactorily completed" if:

- (1) the capability has been developed and used to form a reasonable assessment of regional environmental consequences;
- (2) environmental consequences have been assessed by the Commission in the case of projects having regional impacts; and

(3) it is shown that environmental consequences will be acceptable.

The Commission acknowledges that the development of a detailed ecological model of the Basin would be desirable and that a strong case has been made for such a study by several Basin interests; the Commission expresses its willingness to cooperate with research institutions and scientists in exploring alternative sources of funding and in developing suitable study proposals in addition to the supplemental study program. Estimated costs for the study as a whole and for task one are not suggested as measures of the total investment in environmental research needed in the Basin, but rather as a reflection, first, of levels of investment that are both necessary and appropriate to accomplish the specific study objectives, and, second, of the limit of Federal expenditures for specific study tasks that can realistically be expected under the Water Resources Planning Act in fiscal 1972-1974. Moreover, the environmental reconnaissance is to be accomplished in coordination with related studies that are separately managed and funded, whose total cost will substantially exceed the cost of this task.

The draft Basin plan has been modified in response to the comments principally as follows:

The Commission now acknowledges that decisions concerning optimum flow release rates require further study and accordingly combines its acceptance of a release rate of .2 cfs/m with its recommendation that the desirability and feasibility of this release rate be studied for main stem and tributary reservoirs. While the supplemental study will not provide a basis for predicting the ecological consequences of every alteration of river flow, the Commission will cooperate with member States and agencies and with the scientific community in developing this capability to the extent possible.

The proposed New England regional bulk power facility siting study will include an analysis of the environmental implications of alternative measures for meeting need. The Commission recommends therefore that major power generating and transmission facilities be developed in the Basin as warranted by the results of the two year study.

The Commission now recommends that all proposed diversions of Connecticut River water below the newly constructed nuclear power plant at Vernon, Vermont, including Northfield Mountain, be conditioned on satisfactory completion of environmental impact evaluations of the power plant. It is recommended that these evaluations include careful investigation of the possibility of radioactive contamination of Connecticut River water and its implications for the diversion of Connecticut River water into Quabbin reservoir. It is further recommended that proposed diversions be conditioned on adequate measures to prevent radioactive contamination of diverted water, including water quality monitoring. Diversions at Tully and any diversions at Northfield Mountain above amounts presently authorized by law are now subject to recognition of riparian rights and conditioned on creation, if feasible, of a regional mechanism for allocating water in which downstream States have a voice; on prior measurement of impacts used in measuring "excess flows;" and on prior determination and protection of alternative groundwater sources.

The Commission has modified its recommendation concerning 118 upstream reservoirs to avoid any implication that it supports development of these sites without evaluation of their individual and collective regional impacts. It is emphasized that these sites are suggested for State or local consideration only, and are therefore included in the Basin plan subject to State or local approval.

With the exception of Beaver Brook, all major flood control and multiple purpose reservoirs have been withdrawn from the 1980 Basin plan recommended by the Commission at this time and are included within the scope of the supplemental study.

Review procedure

The response to the Commission's draft findings and recommendations constitutes the third major input to the 1980 Basin plan recommended by the Commission, in addition to the field level investigation and the response to the Coordinating Committee report summarized in the preceding sections. The purpose of this section is to illuminate the concerns expressed by affected interests both within and outside of the Basin and the process by which the Commission arrived at its judgments in response to these concerns.

At the request of Senator Edward Brooke of Massachusetts, the period for comment was extended from 30 to 60 days, running from mid-July to mid-September, following a light response to the first draft dated July 12. A second draft, dated September 1, was prepared in response to the Comments received, widely distributed throughout the Basin, and discussed at a public meeting September 14 in Springfield, cosponsored by the League of Women Voters Inter-League Committee for the Connecticut River Basin and the Connecticut River Watershed Council, Inc.

The response to the Commission's draft report tended to divide into two phases, in which first procedural and then substantive issues were addressed. Prior to the September 14 meeting, public meetings were held with the Springfield City Council and the Connecticut River Ecology Action Corporation (CREAC), to discuss mainly the procedural question whether the Commission would be responsive to expressed public concern with environmental quality in the Basin if it transmitted the Coordinating Committee report along with recommended plan to the Water Resources Council. This concern and these discussions were important reasons for the 30-day extension of the review period. Its principal purpose, however, was to permit thoughtful consideration by a representative range of Basin interests of the content of the Basin plan and in particular of the supplemental study proposal.

Participants included the Basin Governors; the interim Connecticut River Basin Citizens Advisory Board, consisting of members of CRC who volunteered for the task and chaired by Professor Bernard Berger; cities and towns; counties; regional planning agencies; members of the scientific community; watershed associations, the League of Women Voters and other citizens groups; local conservation commissions; industries; and interested individuals. Public notification of the review and public discussion

September 14 was given throughout the Basin.

Comments received during the 60-day public review of the Commission's draft report accompany the 1980 Basin plan transmitted by the Commission to the Water Resources Council and to the Basin States; these are arranged in the order in which they were received and are transmitted as a separate document. Comments received from the Basin Governors and others after transmittal of the plan will be forwarded to the Water Resources Council and to appropriate Commission member States and agencies.

As noted in the introduction, the Water Resources Council has established a procedure for the submission of proposed revisions of completed river basin plans to river basins commissions and for related commission and Council action.

Following is a summary of the comments and the Commission's response. *

*Quotations are taken from the text of comments appended by reference to this report and from the transcript of the public meeting September 14 co-sponsored by the Connecticut River Watershed Council and the League of Women Voters. A copy of the transcript is on file at the Court Street offices of the Commission in Boston.

Interpretation of needs and strategy for meeting needs

Comments on the adequacy of resources

CREAC urged the Commission to endorse a finding by CRC's Subcommittee on Assumptions that "there is a strong viewpoint both within the CRC and throughout the Connecticut River Basin that there is an optimum level of population and industrial development in the Valley beyond which environmental and general social wellbeing for the Valley's inhabitants will be seriously threatened. "

Governor Davis suggested another qualification of the Commission's finding on the adequacy of resources to meet projected needs:

Unless society is willing to modify its unceasing demand upon the natural resources and change its casual treatment of the landscape, the resource may be adequate to meet the needs, but the environmental quality will be impaired by today's criteria. Specific areas of concern include the insatiable demand for power to operate a host of unessential gadgets that serve no critical need, the use of highways and byways to dispose of trash, the continual employment of the capability to cut, fill, dredge, level, drain and otherwise alter the natural terrain to suit man's purposes.

A similar concern was expressed by the Capitol Region (Connecticut) Planning Agency to which the Commission has responded under "Comments on recommendations for implementation" (p. 67).

Comments on strategy for achieving economic and environmental objectives

Governor Davis disagreed with the Coordinating Committee's finding, in which the Commission concurred, that multiple purpose reservoirs would have "important economic and ecological benefits, particularly in the Upper Basin, " on the ground that such benefits have yet to be conclusively established.

Comments on the evaluation of alternatives

Governor Meskill suggested that the Commission take "much responsibility" in developing planning alternatives with individual State and Federal agencies.

Findings and recommendations by study element

Comments on transmittal of the 1980 Basin plan

Several communities in the Massachusetts portion of the Basin and the Massachusetts House of Representatives cited "grave concern" in the Valley that many of the proposed programs in the 1980 Basin plan "may result in significant and irreversible environmental damage and that said plan has not given proper consideration to such environmental consequences." The Commission was urged to defer transmittal of the plan to the Water Resources Council and to declare a "moratorium" on all structural projects having a significant environmental impact until the plan is "ecologically sound." There is generally strong support in the Basin for developing the capability to predict the ecological consequences of all major alterations of the environment on sites where such alterations occur and on the Basin as a whole.

Comments on flow regulation (water quality and power)

Governor Meskill pointed out that decisions on alterations of river flow -- minimum instantaneous flow releases from power dams as well as reservoir construction for low flow augmentation -- should be conditioned on the capability to predict ecological consequences within the Basin as a whole. The New England Power Company cited data developed by the Coordinating Committee's Subcommittee on Stream Flow Regulation to support its argument that .1 cfs, "the weighted average of minimum 7-day low flows from the Connecticut River's major unregulated tributaries, ... is a more realistic approximation of a simulated instantaneous flow (than .2 cfs), and one which might be sustained from natural runoff without drawdown of upstream storage reservoirs." CAB recommended further study of the adequacy of a minimum flow release rate of .2 cfs "to protect ecologic and environmental values in the Connecticut River" for main stem reservoirs, and of releases that would be "desirable or hydrologically feasible" for tributary reservoirs. CAB also recommended a benefit-cost analysis of flow releases above .2 cfs and study of equitable procedures for requiring power plants not up for relicensing to provide desired releases.

Comments on power supply

Governor Meskill felt that the Commission's recommendations for additional power supply should be conditioned on the capability to predict ecological consequences within the Basin as a whole. The Connecticut River Watershed Council suggested that the Commission encourage a partnership of Federal agencies and private industry as possibly the only means of accelerating research and development of new generating technologies "which could have less impact upon our natural resources." The Council felt that endorsement of "large thermal or nuclear plants with reversible pump storage peaking power" would preclude such action. The Capitol Region (Connecticut) Planning Agency felt that the Commission's assessment of power needs should be accompanied by a determination of "plant installation criteria needed to insure protection of our streams and to measure or monitor the detrimental effects on the environment near the plants." The Massachusetts Audubon Society considered incapable of accomplishment the recommendation that existing power supply be more than doubled by 1980 to meet projected demand, because it is based on an "unrealistic figure that placed no curbs on the wildest dreams of the utility industry."

Comments on recreation

Governors Davis and Peterson have questioned projected water-related recreation needs in the Upper Basin. Governor Peterson felt that certain recommendations by the Bureau of Outdoor Recreation, which require joint action by Vermont and New Hampshire, "remain to be explored in greater depth prior to any decision." It is understood that Governor Davis shares this view.

Comments on anadromous fisheries restoration

The New England Power Company suggested the modification described in the following paragraph of the Commission's recommendation concerning fish passage facilities. Governors Peterson and Meskill expressed opposition to three reservoirs -- Honey Hill in New Hampshire and Blackledge and Cold Brook in Connecticut -- that were intended to improve water quality for anadromous fisheries restoration by means of flow augmentation and minimum flow releases. Their views are given under comments on flood control and multiple purpose reservoirs.

Comments on fish and wildlife

Additional measures for wildlife management were suggested by the Franklin County (Massachusetts) Planning Department and by Professors of Biology at Holyoke Community College and Mount Holyoke College. The professors felt that "wildlife appears to be discussed solely in terms of recreation -- i. e. hunting and fishing -- with essentially no concern for habitat protection or protection of endangered species." They suggested that substantial acreage be set aside as wildlife refuges.

Comments on water supply

Governor Peterson requested that Honey Hill reservoir, intended in part for industrial water supply storage, be included within the scope of the supplemental study program. CAB pointed out several CRC recommendations concerning water supply that had not been adopted by the Commission in its July 12 draft report: The Commission was urged to recommend that "an in-depth study of ecologic, economic and social implications" of the proposed modification of Tully reservoir be made "before further action is taken," and that diversion out-of-the-Basin be subject to certain conditions, including establishment of a regional mechanism for allocation of water; monitoring of diversion volumes and reporting to an independent authority; and also the possibility of expanding recreation on Quabbin reservoir in return for the receipt of Connecticut River waters. The Connecticut River Watershed Council stated its continued opposition to any diversions until these conditions "are accepted as part of lawful obligations of the water supply authorities involved." The Capitol Region (Connecticut) Planning Agency also expressed apprehension about the lack of potable water "in the Hartford - Springfield urban corridor if too much water is diverted." CAB also urged study of the future desirability of using "surplus" Connecticut River water for low flow augmentation and water supply within the Basin.

Decisions concerning out-of-Basin water diversion were considered premature on a number of grounds:

the capability needs to be developed to predict the ecological consequences of flood skimming on the Basin "as an interrelated whole" - Governor Meskill;

present and future water supply and demand within the Basin need further study - Connecticut River Watershed Council; Izaak Walton League (Massachusetts);

provision should be made for the investigation, protection and development of groundwater supplies as a possible alternative to diversion - Farmington River Watershed Association; Massachusetts Association of Conservation Commissions (Hampden County Division); CREAC;

a major reduction in water usage by areas requiring supplementary water ought to be explored as an alternative solution -- Capitol Region (Connecticut) Planning Agency;

water quality ought first to be improved to develop the Basin's fishery resources - CREAC.

The Millers River Watershed Association urged that funds for the modification of Tully reservoir be used instread to finance development of new water supply sources for communities that should be taken out of the overtaxed Quabbin reservoir service area. CREAC argued that although it would be cheaper economically to divert clean water from the Tully River into Quabbin, the "proper route to take" environmentally would be to divert water from the polluted Millers River after treatment since "there is no technical problem of drinking polluted water if it is properly treated." If water supply is diverted, the Massachusetts Association of Conservation Commissions (Hampden County Division) argued that recipient communities should pay and receipts should be used to finance a Connecticut River Authority.

The Franklin County (Massachusetts) Planning Department pointed out that diversion would appear to conflict with the Commission's strategy of satisfying resource needs through "development of sound regional water and land use patterns, i. e. (through) the distribution of resource needs according to resource availability." Biology Professors at Holyoke Community College and Mt. Holyoke College pointed out that expanded recreational development of Quabbin reservoir would have a "disastrous" effect on the surrounding wildlife habitat. The Town of Russell, Massachusetts, opposed water diversion from Westfield Brook "for Pittsfield or any other town in that area."

Comments on navigation

Governor Meskill recommended that before any decision is made to implement dredging proposals a study be made of the Basin "as an interrelated whole" and, further, that the development of "predictive, ecological models for the basin as a whole" be included in the scope of task one of the supplemental study. CREAC urged that a model be used to predict the effects on the estuary of changed flows and siltation patterns from dredging. The Franklin County (Massachusetts) Planning Department urged that dredging for recreational navigation be undertaken only when suitable levels of water quality and demand are reached.

Comments on upstream water and related land resources management

Governor Meskill felt that recommendations for upstream watershed reservoirs -- particularly Public Law 566 projects -- contradict the Commission's policy of discouraging development in the flood plain and ought to be conditioned on evaluation of environmental impact on the Basin as a whole. He also joined with Governor Davis in expressing concern for the effect of such projects on wild and scenic rivers. The Connecticut River Watershed Council indicated that it will review Public Law 566 watershed projects recommended by the Coordinating Committee "as part of a separate analysis to be done by a committee of the Council." The Farmington River Watershed Association recommended that the development of groundwater supplies be considered as an alternative to upstream water supply reservoirs. There is general concern about the status and impact of 118 upstream reservoirs suggested for State or local construction.

Comments on flood control and multiple purpose reservoirs

Governors Meskill and Peterson stated their opposition to multiple purpose reservoirs in their States: two State projects in Connecticut, Blackledge and Cold Brook, and two Corps of Engineers projects in New Hampshire, Bethlehem Junction and Honey Hill. They were in substantial agreement that each project should be reexamined in the supplemental study of flood management alternatives, along with other reservoirs previously recommended for restudy -- Victory, Gaysville, Claremont, and Meadow. Governor Meskill stated further that the study needs to be expanded (task one) to include the development of predictive ecological models for the Basin as a whole.

CAB noted that the Commission's intent with respect to Bethlehem Junction and Honey Hill reservoirs "does not emerge as clearly" as in the case of the four reservoirs included within the scope of the supplemental study, and requested that the Commission's recommendation "be made as clear as possible to eliminate ambiguity and avoid possible misunderstanding." It was "disturbing" to the Connecticut River Watershed Council:

to find the Commission's report giving almost sure endorsement to certain multiple purpose structural projects at this time while also calling for studies of alternate management methods and environmental impact. It would certainly seem more appropriate to withhold endorsements of any structural projects until the additional studies requested are completed and available for review.

The Capitol Region (Connecticut) Planning Agency suggested that dry flood control reservoirs be studied for possible agricultural or recreational use "during the 300 or so days a year when they are normally dry." The Agency urged serious consideration of the subsidized Flood Insurance Program of the Department of Housing and Urban Development which, "if properly used, . . . could be a major step in discouraging development of the flood plains by making the property owner pay for the total monetary measure of the flood loss on new construction."

The Glastonbury (Connecticut) Conservation Commission emphasized the inadequacy of flood plain zoning to prevent continued encroachment of the flood plain and its fringes, and, along with the Great Meadows (Connecticut) Conservation Trust, called for more effective measures. Governor Meskill noted that projected inadequate flood storage would appear to contradict the Commission's policy of discouraging further development of the flood plain.

Comments on recommendations for implementation

Governor Davis suggested an evaluation of the adequacy of present programs:

especially in the Federal sector, to meet the critical needs of the basin. . . . The past inadequacies of federal funding, especially in regard to the construction of sewerage treatment plants, is well documented, and it is difficult to comprehend a planning effort that excludes any such comment.

The Capitol Region (Connecticut) Planning Agency felt that "perhaps the greatest need of all is to re-educate the general public in order that we might reduce total demands on our water supplies, preserve the flood plains, reduce both sanitary and storm drain pollution and recycle refuse."

The supplemental study program

Comments on study objectives and procedures

CAB urged that "great care be taken in the statement of objectives and in specification of the procedures to be used in the study," and offered to participate "to the maximum feasible extent" in these efforts.

Comments on study costs

Governor Meskill and the Massachusetts Audubon Society felt that the total estimated cost of the supplemental study (\$700,000) and the estimated cost of the environmental reconnaissance (task one - \$135,000) are inadequate.

Comments on coordination with other research

Governor Meskill recommended that the study be coordinated with a U. S. Geological Survey "Connecticut Valley Urban Pilot Project" through the integration of formats for land use alternatives and their consequences.

Comments on task one, environmental reconnaissance

A principal thrust of the comments received on the 1980 Basin plan and supplemental study has been the need to be able to predict ecological consequences of resource management alternatives on the Basin as a whole before approval of individual

projects having a significant environmental impact. In addition to recommending that the Commission undertake a restudy of flood management alternatives "as a matter of immediate priority," CRC assigned high priority to "studies to determine the ecologic impact of proposed structures and land development plans as soon as possible." A substantial CRC minority felt that a model capable of predicting the environmental consequences of all resource management alternatives should be developed before approval of any projects having a significant environmental impact. This view has been reinforced more recently by comments from Governor Meskill, CREAC, and the Massachusetts Association of Conservation Commissions (Hampden County Division), who took specific exception to the statement that "the development of a detailed ecological inventory and predictive model pertinent to all resource use decisions for the entire Basin is not included within the scope of this task." CREAC stated that "we cannot emphasize strongly enough that [the Commission] reorganize [its] approach to the Connecticut River Basin as a single major ecosystem and bring to bear on the political process sound scientific documentation and systems analysis;" reference was made to a CREAC Scientists Symposium (CREAC publication #1) "for precisely the type of study we urge you to support." A member of CREAC asked, at a public meeting in Springfield September 14, that a study be made of the whole river system

before funds are authorized for the construction of any dam. This seems reasonable at the present time. Twenty years ago it was not reasonable because the volumes of information that had to be collected could not humanly be handled after they were collected. It is now feasible by using computer techniques and systems analyses along the lines of the International Biological Program, which is supported by the National Science Foundation and by allied support items from Congress, in an almost emergency atmosphere.

A number of suggestions have been received concerning the proposed scope of task one, with particular reference to siltation.

Comments on CAB and S/RAC

Governor Sargent and several others felt that the Citizens Advisory Board (CAB) and Science/Research Advisory Committee (S/RAC) should represent out-of-Basin as well as Basin interests and capabilities, in recognition of the impact of Basin resource management on other parts of the New England region. Governor Sargent stated that if CAB and S/RAC were:

totally valley oriented, . . . their findings would be criticized, rightly or wrongly, as the representation of parochial views on a subject of statewide and regional significance. We must reach to all the valuable expertise available throughout the entire state and the New England region for membership in both of these regional citizen groups.

CREAC urged the Commission to aim toward an optimum combination within S/RAC of research capabilities available nationally and internationally. It was argued, at the September 14 public meeting, that:

the primary priority is a large funding and a large-scale study, interdisciplinary, done by objective scientists selected throughout the scientific community, not just from the Basin, not just those who happen to have expressed themselves and who are concerned, but the best experts in the country, because one can look upon the Connecticut River Basin . . . as an example -- the prime example in North America -- of man living in harmony with an eco-system, if it is handled properly.

NEW ENGLAND RIVER BASINS COMMISSION
FINDINGS AND RECOMMENDATIONS

A. FINDINGS AND RECOMMENDATIONS ON INTERPRETATION OF
NEEDS AND STRATEGY FOR MEETING NEEDS

The Connecticut River comprehensive investigation spanned the larger part of a decade marked by profound changes in public attitudes toward the conservation and development of natural resources. Increased awareness of the economic causes and ecological effects of pollution has produced vastly increased public concern with environmental quality, a reexamination of accepted economic principles, growing public acceptance of resource planning by hydrological as well as political boundaries, and a reordering of social, economic and environmental priorities in resource management.

The subject of the Connecticut River investigation was defined hydrologically rather than politically, and to a significant extent the illumination of environmental choices and the protection of environmental values have been facilitated in the Basin as a result. While much has been learned and still more needs to be learned about the ecological costs of structural measures proposed by the Coordinating Committee, many proposals were intended to provide ecological benefits which must also be taken into account and could on further examination outweigh their costs.

The ways in which new emphases in resource management depart from the old are not always obvious, and, like Senate Document 97, are subject to varying interpretations. During this Decade of the Environment, the need for jobs, housing and other human essentials, including protection from natural catastrophes, has been undiminished by increased concern with the environment. The development of natural resources in the Connecticut River Basin to meet these and environmental needs, where development is reconcilable with preservation and enhancement of the Basin environment, is the substance and quite plainly the principal motive of the Basin plan to which the Commission fully subscribes.

The Coordinating Committee report is both a product of the investigation and a product of the times, and inevitably reflects assumptions and criteria that no longer respond fully to public preferences in resource management.* The Commission's findings and recommendations on the interpretation of needs and strategy for meeting needs are therefore intended to provide the Basin plan with an underlying philosophy of resource management that responds to the public's increased concern with environmental quality, without compromising in essential respects the Coordinating Committee's response to resource development needs.

*Revised procedures for evaluation of water and related land resource projects have been recommended by a special task force of the Water Resources Council (July 1970) and are being reviewed by the Office of Management and Budget.

Findings and recommendations on the interpretation of needs

The Commission accepts the Coordinating Committee's findings and recommendations relative to problems and needs with certain modifications described in the following paragraphs.

Adequacy of resources

The Commission accepts the Coordinating Committee's finding that the Basin's water and related land resources "are adequate to meet the needs projected to 1980 and 2020 and to permit the preservation of sites and open spaces needed to balance new areas of growth," with five significant qualifications based upon the Committee's findings:

In general: Increasing concentration of population, income and economic growth in portions of the Lower Basin and in the flood plain threatens the adequacy of the Basin's limited environmental resources to meet future needs, and will continue to do so unless corrective measures are taken. The Commission adopts the finding of CRC that "there is a strong viewpoint . . . throughout the Connecticut River Basin that there is an optimum level of population and industrial development in the Valley beyond which environmental quality and general social wellbeing for the Valley's inhabitants will be seriously threatened." The Commission is directed by the Water Resources Planning Act to develop a "comprehensive, coordinated joint plan for Federal, State, interstate, local and nongovernmental development of water and related resources" in its region. This plan, of which the Basin plan is a part, will establish policies for balanced distribution of ongoing and future resource needs, corresponding in quantity and type to the available supply and unique characteristics of resources in New England. Until generally accepted levels of population and economic development can be established, "beyond which environmental quality and general wellbeing . . . will be seriously threatened," it is recommended that Basin resource management programs be developed in accordance with the strategy for achieving economic and environmental objectives set forth below, and that they be based on careful consideration of the implications of alternative population and economic growth projections.

For power: Unless major technological advancements in power production permit more extensive use of the Basin's coastal and fresh water resources for cooling purposes without extensive environmental damage, the Basin's resources are likely to be inadequate to meet the Basin's own power needs by 2020. The Coordinating Committee identified types of sites generally suitable for future power plants in the Basin but on the whole predicted that the Basin would need to import power by 2020. The adequacy of the Basin's resources to meet power needs must therefore be viewed within a larger New England regional context.

For recreation: If projected increases in population and economic growth take place without careful Basinwide land use planning, the Basin's available land and water for a variety of recreational needs is likely to prove inadequate by 2020. Even with implementation of the Early Action Plan, the Coordinating Committee projects significant deficiencies in water resources to meet fishing and recreational boating demand and in the supply of land for wildlife habitat, particularly in the urbanized Lower Basin.

For flood storage: Natural and artificial flood storage will prove inadequate by 2020 if controls are not exercised over patterns of population and economic growth affecting the flood plains. Even with Federal assumption of greatly expanded responsibility for flood plain management, the magnitude of the task confronting all levels of government in channeling population and economic growth, and in delineating, zoning, acquiring and/or clearing the flood plains, leaves little room for optimism that combined natural valley and artificial storage in 2020 will be adequate to protect both existing flood plain development and environmental values associated with the flood plain itself.

For environmental quality: The Commission finds that unless the public's sense of responsibility for maintaining the quality of the environment continues to increase, and results in improved attitudes and practices regarding power consumption, waste disposal, excavations and other alterations of the environment, the Basin's resources will be inadequate to meet projected needs at present standards of environmental quality by 1980.

Economic needs

1) The Coordinating Committee anticipated that planning criteria in effect at the time would be affected by changing public attitudes toward environmental quality. The essential difference between the Commission's and the Coordinating Committee's findings and recommendations is that the Commission attempts - in response to increased public awareness of environmental needs - to address needs more broadly interpreted to include a balance among economic development and environmental quality, quantitative and qualitative needs.

Recommendation: The Commission recommends that needs identified in the Coordinating Committee report be differentiated between existing needs for which resource use is essential, and existing and future needs which permit discretion in the manner and extent to which they can or should be met. In general, the Commission recommends that future needs be construed flexibly - perhaps as projections of future resource uses or as "desires" rather than "needs" - to permit the achievement of balanced conservation and development objectives.

2) The Commission finds that substantially below-average personal income levels and other indications of economic weakness in the Upper Basin qualify the Coordinating Committee's general conclusion that the Basin economy is "stable and prosperous." The Commission notes that the Coordinating Committee took account of these qualifications in its Early Action Plan, particularly in its recommendations for structural developments in the Upper Basin which would have substantial regional economic benefits.

Recommendation: The Commission recommends that, where applicable, needs associated with economic development be interpreted in Basin management programs to include expressly the need to strengthen the Upper Basin economy.

Environmental needs

1) The Basin's environmental quality needs must receive equal consideration with economic development in Basin planning as a result of the enactment of the National Environmental Policy Act of 1969 and similar State measures, and the Water Resources Council's proposed modification of planning principles, standards and criteria for water and land resource planning. A conclusion drawn by a number of the reviewers was that the Coordinating Committee report seriously understressed environmental quality among the planning objectives.

Recommendation: While the Coordinating Committee recommended several measures to preserve and enhance the environment, the Commission recommends that, in keeping with the letter and intent of recent legislation to protect the quality of the environment, Basin management programs articulate assumptions regarding ecological characteristics of the Basin as well as population and economic projections, identify environmental quality as a planning objective, and expressly substantiate the need for recommended actions in reference to requirements for the preservation of the Basin's environmental resources as well as in terms of economic return.

2) The Commission notes that environmental impact evaluations of the Coordinating Committee's Early Action Plan and several of its components have been prepared pursuant to the National Environmental Policy Act, and that these are subject to public review in accordance with procedures established by the Council on Environmental Quality. The Commission also notes the inadequacy of funding for environmental impact statements often prepared at or near the completion of detailed project planning. The Commission therefore initiates with this report a request for funding for ecological investigations deemed necessary to permit responsible decisions on major projects recommended by the Commission; these are described in Section E, Supplemental Study Program.

Recommendation: The Commission recommends generally that Early Action Plan elements having a significant environmental impact be continually evaluated throughout their planning, development and operation for environmental effects, and that environmental damage where indicated be mitigated or repaired by removal of the cause.

Findings and recommendations on strategy for achieving economic and environmental objectives

1) Recommendation: Since, as the Coordinating Committee has found, the Basin's environmental quality is its primary economic asset, the Commission recommends a long term strategy consisting of that mix of resource management measures which, with due consideration for economic efficiency, protects, enhances and restores environmental quality, both as a social goal of prime importance to the people of the region and as a prime basis for achieving economic objectives. In view of the irreversible nature of major structural programs and their indeterminate impacts on the Basin environment and land use patterns, the Commission recommends that the pace of implementation of major physical projects be geared to the availability of additional information on alternative measures and their economic and environmental impacts.

2) The means of achieving both economic and environmental objectives while satisfying resource needs lies essentially in the development of sound regional water and land use patterns, i. e. in the distribution of resource needs according to resource availability. The Commission notes that the State of Vermont is developing a Statewide land use plan, and the State of Connecticut has completed elements of a Statewide land use plan. Moreover, Congress and the Administration are considering legislation which would establish National land use policy and provide Federal assistance to the States for the development of State land use plans.

Recommendation: The Commission recommends the development of Basin State land use plans and programs along the lines of proposals now before Congress and use of the Commission's proposed Connecticut River Basin Program as a vehicle for interstate cooperation on State land use plans as these apply to the Basin. The Commission recommends further that State and Federal agency Basin management proposals be continuously reevaluated on the basis of their relationship to sound local, State and Basinwide land use patterns.

3) The Coordinating Committee's strategy provides for resource use to accommodate population growth, to stimulate industrial expansion and to strengthen the recreational/service economic base of the Upper Basin. The Commission concurs in the Coordinating Committee's finding that reservoirs for recreational and other uses would have both important economic and ecological benefits, particularly in the Upper Basin. On the other hand, it

has not been conclusively established that these benefits outweigh the costs, and the Commission will therefore reevaluate flood management alternatives -- including proposed major multiple purpose reservoirs in the Upper Basin -- and seek to develop a basis for better understanding of the environmental implications of Basin resource management in its supplemental study program. Recommendations for major structural measures, with secondary consideration of qualitative benefits and costs and without provision for management of future growth patterns, could produce maximum environmental impact of indeterminate nature and extent and possibly undermine long-term economic development objectives.

Recommendation: The Commission recommends careful consideration of structural measures in the Upper Basin which, while they would provide lasting regional recreational benefits, would alter natural features now serving as recreational attractions without public investment.

Findings and recommendations on the evaluation of resource management alternatives

The evaluation of resource management alternatives in the report is insufficiently documented to permit the exercise of independent judgment, particularly with reference to reservoirs. The Commission concurs in CRC's finding that "What is presented is a plan, not alternative plans to which each of the criteria of national efficiency, regional development and environmental quality can be applied. "

Recommendation: The Commission recommends that State and Federal agencies recommending authorization and funding of Basin management programs consider without weighting the multiple objectives; evaluate alternative measures in cooperation with the Commission where such measures have significant regional impacts; present alternative measures to meet the objectives in sufficient detail to permit the exercise of independent judgment and public participation in the evaluation; and respond to expressed public preferences among the objectives. Reference is made to related recommendations on the interpretation of needs and on legal, institutional and financial arrangements for Basin resource management.

B. FINDINGS AND RECOMMENDATIONS ON THE 1980 EARLY ACTION PLAN BY STUDY ELEMENT

This section presents the Commission's findings and recommendations on the ten study elements of the 1980 Early Action Plan recommended by the Coordinating Committee in the following order: water quality; power; outdoor recreation; preservation of sites; anadromous fisheries restoration; resident fish and wildlife; water supply; navigation; upstream water and related land resources management; and flood control and multiple purpose reservoirs. Additional recommendations are presented with specific reference to the estuary.

Recommendations are presented in three basic categories within each study element:

- recommendations of the Coordinating Committee approved essentially without qualification;

- recommendations of the Coordinating Committee approved with qualifications; and

- additional recommendations of the Commission.

The Commission finds the field level investigation adequate to support recommendations of projects having important environmental benefits or acceptable environmental costs, and of projects having a significant environmental impact where such recommendations are conditioned on adequate environmental safeguards. Recommendations of the Coordinating Committee that are approved by the Commission without qualification are therefore generally those characterized by important environmental benefits or acceptable environmental costs. Where qualifications are imposed, these take the form of additional studies or prior implementation of other measures, and are principally intended to maintain the adequacy of the Basin's resources to meet both in- and out-of-Basin needs without unacceptable environmental costs.

Inclusion of all major environmental alterations in the Basin plan -- except those for which executive and legislative authorizations have been obtained -- is conditioned on one or more of the following environmental safeguards:

- Inclusion within the scope of the supplemental study program. The study includes an evaluation of flood manage-

ment alternatives, but a broader purpose is to furnish information that will be useful in evaluating the environmental impact of all structural projects, including power generating and transmission facilities, recreational facilities, navigation and other projects. This study will provide an additional environmental screening for structural elements of the 1980 Basin plan taken as a whole, and is also expected to provide a foundation for environmental evaluations at the project authorization level. Its ultimate purpose is to insure conformance of the 1980 Basin plan to the letter and intent of the National Environmental Policy Act. Flood management projects not expressly included within the scope of the supplemental study are subject to one or more of the remaining qualifications.

Satisfactory completion of environmental impact evaluations pursuant to the National Environmental Policy Act. Environmental impact evaluations will be considered satisfactorily completed if: (1) the capability has been developed and used to form a reasonable assessment of regional environmental consequences; (2) environmental consequences have been assessed by the Commission in the case of projects having regional impacts; and (3) it is shown that environmental consequences will be acceptable.

Continual evaluation for adverse environmental effects throughout project planning, development and operation, with mitigation of environmental damage or repair by removal of the cause. This safeguard is applied in recognition of the relatively undeveloped state of environmental impact analysis, and of the need for effective remedial action where serious and irreparable environmental damage is indicated.

Prior implementation of environmentally protective or less hazardous alternatives.

Where major environmental alterations have received executive or legislative authorization, their inclusion in the plan is subject only to further executive or legislative action for which qualifying recommendations of the Commission may serve as a guide.

The Commission is guided by the judgment of the Basin Governors concerning projects within their own States. It is

emphasized, however, that no project recommended by the Coordinating Committee has been withdrawn from consideration: every element of the 1980 Early Action Plan recommended by the Coordinating Committee is recommended by the Commission for inclusion in the 1980 Basin plan, subject in some cases to qualifications, or for further consideration in the supplemental restudy of flood management alternatives.

Projects endorsed by the Commission are in turn subject to the endorsement of the Water Resources Council and the President, before these are transmitted as part of the approved 1980 Basin plan to the Congress. Recommendations transmitted by the President to the Congress, and by the Commission to the Basin Governors, are subject to closer administrative and legislative scrutiny in the normal course of project authorization and funding.

1. WATER QUALITY

The Commission recommends implementation of the following elements of the Coordinating Committee's Early Action Plan for water quality:

adoption by all pollution sources of at least secondary water pollution control treatment facilities with minimum 85 percent removal of biochemical oxygen demand (BOD), as an initial step toward achieving State-Federal water quality standards and reducing the projected untreated wasteload to about 236,000 pounds per day. Because only one percent of the Basin's waste load is presently removed by secondary treatment, the Coordinating Committee found that the present quality of significant portions of the Basin's waterways precludes or impairs their use for recreation, fish and wildlife habitat, public water supply and aesthetic enjoyment. The Commission concurs with the Committee's finding that "the most immediate and pressing need is for the construction of adequate waste treatment facilities at all municipal and industrial waste sources; "

regulation of flows at existing impoundments to provide adequate minimum releases;

greatly expanded water quality monitoring to evaluate the impact of recommended improvements;

additional research: on the role of low flow augmentation, after implementation of planned secondary treatment facilities; on methods of controlling effects of combined sewer discharge; on pollutants from rural and urban watersheds; on sewage diversions to alternate watersheds; on sludge deposits created by long-term discharge of wastes, particularly behind main stem power dams; on bank erosion and its effects of aquatic life; and on the impact of multiple thermal discharges on receiving waters. The problem of sludge deposits will be analyzed in the Commission's proposed supplemental study program.

Because certain presently degraded reaches are projected to have major and moderate deficiencies in the dissolved oxygen level, even assuming a minimum 85 percent removal of BOD by secondary treatment, the Commission recommends that highest priority be given to the development of feasible methods of advanced waste treatment, or combinations of advanced waste treatment methods and other alternatives to achieve the adopted water quality standards.

In accordance with the Water Quality Act of 1965, it is recommended that low flow augmentation not be provided as a substitute for feasible waste treatment at the source. The Commission recommends study of the role of low flow augmentation as a means of meeting water quality standards prior to construction or alteration of reservoirs for that purpose. It is proposed that environmental factors that should be considered in planning alterations of river flows be identified in task one of the supplemental study, and that environmental implications of alternative flood management measures be evaluated in subtask two of task four, with particular reference to the effects of alterations of river flow.

Related recommendations concerning alterations of river flow are presented under study element two, Power.

2. POWER

The Commission will participate in a two-year comprehensive study of electric bulk power facility siting in New England, to be carried out in cooperation with the New England Energy Policy Staff established by the New England Regional Commission, with the Commission's Committee on Power and the Environment and the electric power industry of New England. Provision will be made for citizens participation in the study, which will be completed June 30, 1974. This study proposal was developed independently of the Connecticut River Basin comprehensive water and related land resources investigation. It represents recognition of the need for regionwide system planning in the development of optimum bulk power systems to meet future power requirements of the New England region. Among its principal objectives is the development of means of assuring consideration of environmental factors in power plant siting in New England. The environmental implications of alternative technologies will be analyzed for their effect on the selection of regional power plant sites. Criteria will be developed for the installation of major power facilities that will provide for the monitoring of environmental consequences and restrict adverse environmental effects.

The Commission recommends that power generating and transmission facilities be developed in the Basin as warranted by the results of the two-year power plant siting study. The Coordinating Committee's recommendation that existing private and municipal utility system power supply more than double by 1980 to meet projected demand is therefore included within the scope of the study, as is its recommendation that future thermal power plant siting be confined to tidal sections of the river and to the main portions of hydroelectric station ponds where circulating water systems could be used.

Since specific power projects were not recommended in the Coordinating Committee's Early Action Plan, no projects are specifically included within the scope of the power plant siting study in the same manner that flood control and multiple purpose reservoirs are included within the scope of the restudy of flood management alternatives. It is understood, however, that specific project proposals will be subject to the findings and recommendations of the power plant siting study.

The Commission concurs with the Coordinating Committee's expressed concern over the possible ecological effects of thermal discharge; cooling water requirements for thermal electric generation - the largest but nonconsumptive industrial water demand in the Basin - are projected to increase over sixfold between 1960 and 2020. A study of the impact of multiple thermal discharges on receiving waters is recommended in study element 1, Water Quality.

The Commission recommends study of minimum flow releases below all dams in the Basin, to determine:

the feasibility and desirability of a 0.2 cfs release rate for main stem reservoirs;

the extent of releases that would be desirable and feasible for dams on the tributaries; and

means of requiring power plants not up for relicensing to provide desired releases.

Pending a study of the 0.2 cfs release rate for main stem reservoirs, the Commission provisionally approves the regulation of flows recommended by the Coordinating Committee to provide minimum flow releases of 0.2 cfs at four main stem power projects -- Wilder, Bellows Falls, Vernon and Turners Falls. While the supplemental study will not provide a basis for predicting the ecological consequences of every alteration of river flow, the Commission will cooperate with member States and agencies and with the scientific community in developing this capability to the extent possible.

3. OUTDOOR RECREATION

The Commission recommends implementation of the following elements of the Coordinating Committee's Early Action Plan for outdoor recreation:

Establishment of a Connecticut River National Recreation Area, generally as described in the Bureau of Outdoor Recreation's 1968 report, "New England Heritage."

This recommendation is subject to the understanding that the National Recreation Area concept is being modified by the Department of the Interior and, as the proposed Connecticut Historic Riverway, now emphasizes preservation of the Basin's existing landscape and cultural pattern in place of active outdoor recreational use. The original proposal consists of the following Federal and State elements:

Federal: 23,500-acre Coos Scenic River unit in northern New Hampshire and Vermont; 12,000-acre Mount Holyoke unit in Massachusetts; 21,200-acre Gateway unit in Connecticut; and a 280-mile Connecticut Valley Trail and a Connecticut Valley Tourway. The Commission adopts a CRC recommendation (CRC report, page VI-2) that implementation of the proposed Connecticut River National Recreation Area be subject to the approval of each unit by local advisory committees, and, in the case of the Coos unit in northern New Hampshire and Vermont, to the appointment and approval of "an officially established advisory committee . . . similar to the ones existing in Massachusetts and Connecticut."

State: 18,300-acre Cockaponset State Forest, 4,400-acre Glastonbury Meadows State Park and 250-acre Windsor Locks-Kings Island State Park, in Connecticut; 4,800-acre Mount Tom State Park and 31,000-acre Northfield Mountain State Park, in Massachusetts; and 14,000-acre Connecticut Lakes State Park, 15,400-acre Moore-Comerford Interstate Park, and a 27,500-acre Rogers' Rangers Historic Riverway, in New Hampshire and Vermont. Non-Federal elements of the proposed Connecticut River National Recreation Area, like non-Federal elements of the Basin plan generally, are endorsed subject to State or local approval.

Streambank acquisition for public access to Basin fishery resources. Nearly two-thirds of the Basin's water bodies of 100 to 500 acres in size are unavailable for recreational use because of insufficient access. Only 61 have public access for a broad range of outdoor recreational activities.

Basinwide wild and scenic river program.

Continued environmental studies of the feasibility of using water supply impoundments to meet recreational needs.

Recommendations to meet recreational needs for fishing and hunting, recreational boating and water and related land recreational needs are discussed under study element 4, Preservation of Sites; study element 5, Anadromous Fisheries Restoration; 6, Resident Fish and Wildlife; 9, Upstream Water and Related Land Resources Management; and 10, Flood Control and Multiple Purpose Reservoirs. The Commission adopts the Committee's finding that Early Action Plan proposals for recreation and land acquisition for National forests, the National Recreation Area, streambank access, wild and scenic rivers and flood plain management would meet almost all of the demand for recreational land.

The Commission recommends in addition that the Federal Government explore the modification of policy concerning Federal financial contributions to the acquisition and protection of open space for outdoor recreation, with a view toward providing a sliding scale of Federal support for State and local actions based upon the degree of national and regional interests. The Bureau of Outdoor Recreation should be funded and authorized to provide professional staff assistance for a period of two to three years to assist the Basin States in organizing State and local responses to the findings and recommendations of the Bureau's "New England Heritage" report.

Because State and Federal recreation areas are some distances away from heavy Lower Basin urban demand centers, high priority should be given to water based recreational development within the urban environment.

Neither the Commission's nor the Coordinating Committee's recommendations for outdoor recreation would meet projected 1980 recreational water demand. The Commission recommends that further environmental alterations for recreational purposes be subject to:

satisfactory completion of environmental impact evaluations pursuant to the National Environmental Policy Act, based in part on the Basinwide environmental reconnaissance in the proposed supplemental study program;

continual environmental evaluation throughout project planning, development and operation, with provision for project modification to reduce or eliminate adverse effects; and

conformance with the recommended strategy for meeting economic and environmental objectives in the Basin, with consideration for the implications of alternative population and economic growth projections.

4. PRESERVATION OF SITES

The Commission recommends implementation of the Coordinating Committee's Early Action Plan for preservation of nearly 600 archeological and over 250 natural and historical sites.

The State of Vermont has expressed opposition to Victory reservoir which is included within the scope of the Commission's proposed restudy of flood management alternatives. It is therefore subject to a minimum delay of 30 months from the start of the study, or to abandonment, depending on the results of the study. In its place, the Commission adopts the statement in Figure 48, Appendix O of the Coordinating Committee report, that "the Victory wetlands, with a diversity of habitats and wildlife, must be regarded as a unique and significant state resource and accordingly should be given special protection."*

Three general classifications of sites having unique natural values are added to the list of sites for preservation and controlled use:

proposed sites of large flood control and multiple purpose reservoirs and Public Law 566 small watershed impoundments included within the scope of the supplemental study program, with provision for interim outdoor recreational use pending commitments on development and for permanent outdoor recreational use in the case of sites abandoned for reservoir use where such use is compatible with soil suitability and neighboring land uses;

the undeveloped or sparsely settled flood plains, with particular reference to flood plains now in agricultural, recreational or other open spaces uses; and

the remaining undeveloped portions of the estuary, possibly through expansion of the National Recreation Area proposal to include marshland or upland areas.

*The 3600-acre Victory wetlands were purchased by the Vermont Fish and Game Department December 30, 1969.

5. ANADROMOUS FISHERIES RESTORATION

The Commission recommends implementation of the following elements of the Coordinating Committee's Early Action Plan for anadromous fisheries restoration:

Erection of fish passage facilities at the Turners Falls, Wilder and Bellows Falls main stem power dams. Construction of fish passage facilities at a given dam will be contingent upon completion and successful operation of all downstream fish passage facilities, and, in the case of a licensed hydroelectric project, a determination by the Federal Power Commission that such a facility is in the best public interest.

Improvement or replacement of the fish passage facility at Holyoke dam, to accommodate increased numbers of fish to be passed through new facilities at other dams.

Installation of fish hatchery facilities to provide one million smolt (two-year-old salmon) annually.

Streambank acquisition for fishing, coordinated with streambank acquisition for other uses.

Interstate cooperation in operation of fish hatcheries and sharing of the fish harvest.

Minimum flow releases from existing dams (See study element 2, Power).

Flow augmentation from three multiple purpose reservoirs - Honey Hill, Black Ledge and Cold Brook - had been recommended by the Coordinating Committee for anadromous fisheries restoration. These reservoirs are included within the scope of the supplemental study program and are not included in the 1980 Basin plan recommended by the Commission at this time.

The Commission recommends in addition that public and private interests sharing responsibility for the operation of power and other reservoirs together develop an equitable method of sharing the cost of recommended fish passage facilities.

6. RESIDENT FISH AND WILDLIFE

The Commission recommends implementation of the following elements of the Coordinating Committee's Early Action Plan for resident fish and wildlife:

streambank acquisition for public access to fishery resources, coordinated with streambank acquisition for other purposes;

construction of fish hatcheries and fish ladders,* and

acquisition or zoning of presently unprotected wetland and upland areas.

The Commission recommends construction of small upstream watershed projects to provide fish and waterfowl habitat, flow augmentation benefits and shoreline acquisition, with qualifications discussed under study element 9, Upstream Water and Related Land Resources Management.

The Commission recommends in addition that State and Federal agencies responsible for the administration of open space and recreational land acquisition programs develop, under the auspices of the Commission's Connecticut River Basin Program, a long-range Basinwide program for public streambank access and use, which would recommend an appropriate and effective allocation of financial and administrative responsibilities. The need for early and coordinated action is accentuated by the rate of progress in restoring water quality and escalating demands for shoreline land.

The Coordinating Committee report documents a continuing trend toward the disappearance of wildlife species and the reduction of wildlife habitat in the Basin. Because a resource base overburdened by population growth and economic development cannot support wildlife -- because deterioration of the quantity and quality of wildlife habitat is associated with deterioration of the human environment -- the protection of remaining wildlife habitat is an essential objective of the recommended strategy for meeting economic and environmental needs. The Commission recommends that, until policies are established governing population and economic growth patterns in the New England region, Basin resource management programs be developed that are compatible with the requirements of wildlife management. Appropriate State and local agencies are particularly urged to identify and utilize opportunities to improve wildlife

*Already recommended on the main stem for anadromous fisheries restoration.

habitat and to encourage improved wildlife management practices by private land owners. Additional land management measures that will improve wildlife habitat are recommended under study element 9, Upstream Water and Related Land Resources Management

7. WATER SUPPLY

The Commission endorses the Coordinating Committee's recommendation for expansion of municipal and industrial water supplies.

Congress has authorized and appropriated funds to begin construction of Beaver Brook reservoir, on the Ashuelot River, to provide water supply storage for Keene, New Hampshire. It is included in the 1980 Basin plan, under study element 10, flood control and multiple purpose reservoirs, with the approval of Governor Peterson. Honey Hill reservoir was recommended by the Coordinating Committee to provide storage for industrial water supply; it has been withdrawn from the 1980 Basin plan recommended by the Commission at this time, and is included within the scope of the supplemental study program.

The Massachusetts Legislature has authorized diversion of Connecticut River water into Quabbin reservoir by the Northfield Mountain pumped storage project to meet water supply needs of the Metropolitan District Commission service area. The inclusion of this project in the 1980 Basin plan is subject only to further legislative or executive action, for which qualifying recommendations of the Commission may serve as a guide. The Commission recommends continual evaluation for adverse environmental effects throughout project planning, development and operation, with mitigation of environmental damage or repair by removal of the cause.

The Commission notes that Quabbin reservoir, Massachusetts' largest water supply serving nearly half the State's population, has not recovered from the drought of the middle and late 1960's. It has decreased more than five percent -- or four and one-half feet -- in the past year and has exceeded its maximum safe yield continuously for several years. Interbasin transfers from the Merrimack River basin are considered appropriate and acceptable long term solutions and are in the early stages of planning. Transfer of excess flows from the Connecticut River Basin is considered an essential short term solution, and is therefore not considered inconsistent with a long term strategy of satisfying resource needs through sound management of population and economic growth patterns.

The Commission recommends that all proposed diversion of Connecticut River water below the newly constructed nuclear power plant at Vernon, Vermont, including Northfield Mountain, be conditioned on satisfactory completion of environmental impact evaluations of the power plant. It is recommended that these evaluations include careful investigation of the possibility of radioactive contamination of Connecticut River water and its implications for the diversion of Connecticut River water into Quabbin reservoir. It is further recommended that proposed diversions be conditioned on adequate measures to prevent radioactive contamination of diverted water, including water quality monitoring.

Diversion of surplus water from the Basin is recommended subject to recognition of riparian rights, specifically, the right of return of these waters when needed for water supply or flow augmentation within the Basin.

The Commission recommends diversion of water from the Millers River watershed into Quabbin reservoir, to meet water supply needs of the Metropolitan District Commission service area, by modification of the existing Tully reservoir to include storage for flood skimming. Approval of Tully and any diversions at Northfield Mountain above amounts presently authorized by law* are conditioned on:

creation of a regional mechanism for allocating water in which downstream States have a voice. In the event that the creation of such a mechanism proves unfeasible, it is recommended that its functions be performed by existing institutions with appropriate regional resource management capabilities;

prior measurement of the impacts -- environmental, social, public health, economic and other -- used in determining "excess flows;"

*The amount of water that may be diverted at Northfield Mountain is limited by Massachusetts law over a three consecutive year period to 375 million mgd for each day that river flow exceeds 17,000 cfs at Montague City. Diversion is prohibited by law on any day when flow is less than 17,000 cfs at Montague City. Chapter 766, Acts of 1970, M. G. L.

prior determination of the location and available yield of alternative groundwater sources in the Basin and on development of adequate measures for their protection, in coordination with environmental and flood management studies conducted as part of the supplemental study program.

Environmental, social and economic impact studies of proposed water diversions from the Basin are being carried out as part of the New England Water Supply (NEWS) study under the direction of the Corps of Engineers.* These include a study by Essex Marine Laboratory, Inc., to predict the probable impact of upstream freshwater diversion on the Connecticut River estuary,** and an assessment by Abt Associates, Inc., of the socio-economic effects of diversions out of the Millers River Watershed (Tully) and out of the Connecticut River at Northfield, Massachusetts. Both studies are being done under contract with the Corps of Engineers and are scheduled for completion in December 1971, and April 1972, respectively. The Commission recommends that appropriate remedies be applied should these studies reveal a risk of significant adverse impact from proposed diversions, including Northfield and Tully.

The Commission has recommended continued environmental studies of the feasibility of using water supply impoundments to meet recreational needs, under study element 3, Outdoor recreation. The Commission recommends that specific consideration be given to expanded recreational development of Quabbin reservoir, in part for the benefit of Lower Basin metropolitan area residents, in return for the allocation of Lower Basin water supply to meet out-of-Basin needs. Emphasis should be given to recreational proposals that are compatible with continued maintenance of wildlife habitat in surrounding areas.

The Commission's recommendations for power plant cooling water supply are discussed under study element 2, Power.

* Described in Appendix C.

** A draft report of the estuary impact study was submitted to the New England Division, Corps of Engineers, in August 1971: Essex Marine Laboratory, Possible Effects of Various Diversions from the Connecticut River (draft) report to the U.S. Army Corps of Engineers, Report No. 2, Essex, Connecticut.

8. NAVIGATION

The Commission recommends implementation of the following elements of the Coordinating Committee's Early Action Plan for navigation, subject to satisfactory completion of environmental impact evaluations pursuant to the National Environmental Policy Act, as defined in the introduction to this section.

Enlargement of the present commercial navigation project from Saybrook Light to Hartford to a depth of 16 feet and to a width of 250 feet, provided that suitable spoil areas are located for the placement of dredged material.

Construction of a 32-mile recreational navigation channel between Hartford and Holyoke, provided that proposed alterations of the Windsor Locks Canal, listed in Appendix O of the Coordinating Committee report as an historic landmark, are acceptable to the State of Connecticut.

Dredging for recreational navigation in the 14-mile reach between Holyoke dam and the Northampton-Hatfield line.

Recreational navigation improvements on the main stem behind the Holyoke, Turners Falls, Vernon and Bellows Falls power dams, consisting of the removal of shoals, navigation aids and bypass trailer service.*

The Coordinating Committee found that the recommended Hartford-to-Holyoke recreational boating project would accommodate an additional 4,000 boats and partially meet recreational boating demand, which is projected to triple by 2020. The Commission accepts this finding as a measure of the burden placed upon the Lower Basin's environmental resources by the continuing concentration in that region of population, income and economic growth. The Commission recommends that measures to alleviate recreational boating pressures on the Lower Basin's water resources be developed in accordance with the recommended strategy for meeting economic and environmental needs and with sound management of regional population and economic growth patterns.

*The Vermont Agency of Environmental Conservation opposes recommended navigation improvements behind Vernon and Bellows Falls power dams and feels that, with the exception of the provision for portage, these areas should be regarded as primarily canoeable waters.

9. UPSTREAM WATER AND RELATED LAND RESOURCES
MANAGEMENT

The Commission recommends implementation of the following elements of the Coordinating Committee's Early Action Plan for upstream water and related land resources management:

Land treatment (e. g. erosion control) measures on over 1.2 million acres of non-Federal land, including 204,000 acres of agricultural land, 150,000 acres of urban land and 823,000 acres of private, non-industrial forest land.

Land management measures for the Green and White Mountain National Forests consisting of the following:

land treatment measures on 64,000 acres;
soil surveys and watershed analyses on
approximately 306,000 acres; and fish and
wildlife surveys and watershed analyses on
30,500 acres; and

structural improvements, including
recreational facilities on 555 acres; three
recreational impoundments which would
provide 310 surface water acres; 225 miles of
roads and trails; 37 fire control heliports;
and 37 acres of fish and wildlife improvements.

Resource, conservation and development projects.

Accelerated planning assistance to 180 towns in the preparation of resource inventories, town soil reports and interpretations, flood plain information studies and soil surveys involving 1.5 million acres of non-Federal lands.

Local land use regulations for environmental protection.

Protection of open spaces through sound resource management practices.

Loans and grants for rural water supply and waste treatment.

Accelerated conservation education.

Of 17 upstream watershed projects recommended in the Coordinating Committee's Early Action Plan, including 78 floodwater retarding and multiple purpose structures, three are currently planned Public Law 566 projects for which State executive approvals have been obtained:

West Branch, Westfield River, Massachusetts;

Upper Quaboag River, Massachusetts; and

Sugar River, New Hampshire.

These are included in the 1980 Basin plan subject only to further legislative or executive action. The Commission recommends continual evaluation of these projects for adverse environmental effects throughout project planning, development and operation, with mitigation of environmental damage or repair by removal of the cause.

Upstream watershed projects including flood control reservoirs are generally included within the scope of the Commission's proposed restudy of flood management alternatives; evaluation of individual projects will be limited to major reservoirs that would be constructed by the Corps of Engineers. Commission approval of upstream watershed projects, individually and as a system, is conditioned on satisfactory completion of environmental impact evaluations pursuant to the National Environmental Policy Act, as defined in the introduction to this section. The following nine projects are included in the 1980 Basin plan, subject to the additional requirement that flood plain regulations be made an integral part of Public Law 566 project planning:

Two upstream watershed projects currently being planned under Public Law 566:

Indian - Mascoma River, New Hampshire.

Indian Brook, New Hampshire.

Seven potential Public Law 566 projects, subject to local sponsorship:

Mill River, Massachusetts.

Mohawk River, New Hampshire.

East Branch, North River, Vermont.

North Branch, Deerfield River, Vermont.

Whetstone project, Vermont.

Ball Mountain Brook, Vermont.

Passumpsic-Moose Rivers, Vermont.

The Commission recommends further in-depth evaluation of five additional Public Law 566 small upstream watershed projects to determine economic feasibility:

Upper Ammonoosuc River, New Hampshire.

Gale River, New Hampshire.

Blow-Me-Down Brook, New Hampshire.

Black River, Vermont.

Wells River, Vermont.

An additional 118 upstream impoundment sites were identified by the Coordinating Committee for possible development by State and local interests for a variety of purposes. These are recommended by the Commission for continuing State and local consideration. Commission approval of reservoir construction on any of these 118 sites is conditioned on evaluation of their individual and collective regional impacts. Because these sites are suggested for State or local consideration only, it is emphasized that they are included in the Basin plan subject to State or local approval.

The Commission recommends continued efforts to consolidate patterns of ownership within the National forests to secure effective forest land management. Combinations of new land acquisition, as recommended by the Coordinating Committee, and exchanges of land will probably be necessary tools. The Commission notes that the question of achieving equity in the effect of Federal land acquisition on local tax bases has been generally reviewed by the Public Land Law Review Commission and is being studied further within the Federal Government.

Land management measures generally imply long-term decisions concerning Basinwide land use patterns. Although the Coordinating Committee found that implementation of the Early Action Plan would increase publicly available land from 10.2 percent of the total Basin land area in 1965 to 12.6 percent in 1980, and land available for intensive recreational use from one to almost three percent, the Commission finds that the achievement of both economic development and environmental quality objectives and the implementation of a sound strategy for Basin resource management require even greater emphasis on public land controls for a variety of recreational and other economic and environmental purposes. The Commission recommends that Basin land management measures be developed in accordance with this objective, and generally in accordance with sound management of regional population and economic growth patterns.

10. FLOOD CONTROL AND MULTIPLE PURPOSE RESERVOIRS

The Commission recommends a restudy of flood management alternatives as part of the supplemental study program to meet a comprehensive range of flood plain management needs, including preservation of natural flood storage for protection and enhancement of environmental values as well as for flood protection. This study, described in section E, below, is intended to serve as the basis for Congressional and State consideration of a Basin flood management plan recommended by the Commission. It is needed to permit informed judgment concerning regional impacts -- social, economic and environmental -- associated with structural and non-structural flood management alternatives. Although the development of a detailed ecological model of the Basin is beyond its scope, the study will be coordinated with other research efforts which together will support reasonable assessments of regional environmental consequences.

The product of the study will be a report or reports recommended for adoption by the Commission and for transmittal to the President, to the Congress and to the Basin Governors as elements of the Commission's comprehensive, coordinated joint plan for water and related land resources in New England.

The Commission recommends participation by Federal agencies with primary responsibility and competence in relevant fields, by consultants retained by the Water Resources Council and/or by the Commission, by citizens' interests through the Citizens Advisory Board, and by the scientific community through a Science/Research Advisory Committee. The latter two groups will be established by the Commission and made permanent parts of the Commission's Connecticut River Basin Program.

A total appropriation of \$700,000 is requested for the performance of the recommended two and one-half year study, under joint State - Federal management and coordination through the Commission's Connecticut River Basin Program.

With the exception of Beaver Brook, all major flood control and multiple purpose reservoirs recommended by the Coordinating Committee have been withdrawn from the 1980 Basin plan and are included within the scope of the supplemental study. These include two projects recommended for State implementation, Blackledge and Cold Brook, in Connecticut, and six Corps of Engineers projects: Meadow in Massachusetts; Bethlehem Junction, Claremont and Honey Hill in New Hampshire; and Gaysville and

Victory in Vermont. The need for additional analysis is considered sufficient to warrant a minimum delay of 30 months from the start of the supplemental study program to permit completion of the study. Because of Congressional de-authorization of Claremont and State opposition to the remaining reservoirs, these projects are included within the scope of the supplemental study program for analytic purposes only, and will be recommended for implementation only if the study results warrant and State and Congressional opposition has been withdrawn. These projects are not included in the 1980 Basin plan recommended and submitted by the Commission to the Water Resources Council at this time.

Beaver Brook reservoir was authorized by the Flood Control Act of 1968, and Congress has appropriated funds to begin land acquisition in fiscal 1972. Its purposes are to provide flood protection, water supply and recreation principally for Keene, New Hampshire, on the Ashuelot River. Because it has been authorized by Congress, Beaver Brook's inclusion in the Basin plan is subject only to further legislative or executive action, for which qualifying recommendations of the Commission may serve as a guide. The Commission recommends continual evaluation for adverse environmental effects throughout project planning, development and operation, with mitigation of environmental damage or repair by removal of the cause.

The Commission endorses the Coordinating Committee's recommendation for modification of three* existing Corps of Engineers flood control reservoirs to include uses for recreation, fish and wildlife enhancement and water supply, subject to satisfactory completion of environmental impact evaluations pursuant to the National Environmental Policy Act, as defined in the introduction to this section;

* Modification of Barre Falls reservoir was included in portions of the Coordinating Committee report as an alternative to advanced waste treatment. Relevant Massachusetts and Corps of Engineers positions are stated in pages XI-4, 11-12, of the Coordinating Committee Main Report.

Union Village, on the Ompompanoosuc River in Vermont (recreation), subject to improvement of water quality on the West Branch;

Tully, on the Millers River in Massachusetts (recreation and diversion of water supply to Quabbin reservoir), subject to conditions set forth under study element 7, Water Supply; and

Knightville, on the Westfield River in Massachusetts (recreation and low flow augmentation for fisheries enhancement), subject to the Commission's investigation of the replacement of wildlife habitat that would be lost by creation of a recreation pool.

Although the Coordinating Committee found that most main stem hydroelectric reservoirs have insufficient storage capacity to effect any reduction in flood stages, the question is raised whether reregulation of existing power reservoir flows throughout the Basin would appreciably increase available flood protection for the major main stem damage centers. The Commission recommends that the possibility of reregulating total Basin-wide existing power storage capacity for flood protection be evaluated in its proposed restudy of flood management alternatives, and, if study results warrant, that this proposal be incorporated in the 1980 Basin plan.

The Commission recommends in addition that existing dry-bed flood control reservoirs be studied for possible agricultural or recreational use during periods when they are normally dry.

The Coordinating Committee recommended local flood protection works on the Little and Westfield Rivers in Westfield, Massachusetts, substantially as authorized by Congress in the Flood Control Act of 1960 and by the Massachusetts Legislature in 1962. * Inclusion of the recommended dikes, road-walls, pumping stations and channel improvement in the 1980 Basin plan is therefore subject only to further legislative or executive action, for which qualifying recommendations of the Commission may serve as a guide. The Commission recommends continual evaluation of this project for adverse environmental effects throughout project planning, development and operation, with mitigation of environmental damage or repair by removal of the cause.

The Commission recommends implementation of three Coordinating Committee Early Action Plan recommendations for local flood protection works, considered necessary to complement other flood control measures, conditioned upon satisfactory completion of environmental impact evaluations based in part on the proposed Basinwide environmental reconnaissance:

Lancaster, New Hampshire (small ice retention dam and channel improvement);

St. Johnsbury, Vermont (dike and pumping station); and

Hartford, Connecticut (conduit with headwall and pumping structure).

*Chapter 638, Acts of 1962, M. G. L. Funds borrowed by the Massachusetts Water Resources Commission to represent the Commonwealth in project development were reallocated to other purposes following withdrawal of local support. At the request of U. S. Representative Edward Boland, of Springfield, funds requested in 1971 by the New England Division, Corps of Engineers, to prepare a survey report for Westfield River local protection works and other projects were diverted to the Water Resources Council for Basin environmental studies. The amount requested - \$110,000 - is included in the supplemental study budget for Fiscal Year 1972.

A fifth local protection project recommended by the Coordinating Committee at Hartford, Vermont (excavation to alleviate risk of ice jam flooding), has been completed.

The adequacy of existing local protection works and the desirability of expanding local protection needs clarification. While criticism of the Coordinating Committee's flood control plan focuses on the relative merits of reservoirs and flood plain management, considerable public investment has already gone into local protection devices for the major damage centers. The Commission recommends in its proposed restudy of flood management alternatives that the economic cost and engineering feasibility of improving these works be assessed in greater detail, along with the loss of natural Basin storage and concomitant increase in flood stages and damages that result downstream from building new dikes and walls in natural flood storage areas.

The Commission recommends implementation of the following Coordinating Committee Early Action Plan recommendations for nonstructural flood protection measures:

flood plain zoning along over 200 miles of the main stem from Saybrook, Connecticut, to above White River Junction, Vermont, shown on plates M-6 to M-28 of Appendix M of the Coordinating Committee report;

public information programs on the availability of flood plain insurance and flood fighting;

improved operation of flood control reservoirs, through expansion of a Corps of Engineers computerized network of remote river stage data stations; and

improvement and expansion of flood forecasting service for the Basin provided by the National Weather Service Forecast Center.

It has been noted that unless controls are exercised over patterns of population and economic growth affecting the flood plains, natural and artificial flood storage will prove inadequate by 2020. If so, substantial public investment in artificial flood storage or other costly flood protection measures will be needed. The Commission concurs in the Coordinating Committee's finding that "indiscriminate flood plain encroachment . . . would more than offset protection gained by reservoirs and local protection works."

The Federal interest in flood plain management has broadened since the Federal interest in flood control was established by the Flood Control Act of 1936, but it must be broadened further. The scope and impact of Federal structural flood protection measures contrast sharply with the minimal effect of nonstructural measures administered by the States and localities. A comprehensive approach is needed to the concept of flood plain management rather than to the narrower concept of flood control. This approach must be developed and coordinated, at the initiation of the Federal government, among Federal and State agencies and local governments.

The Commission recommends shared responsibility among the three levels of government for flood plain management, with emphasis on Federal-State financial and administrative responsibility for flood plain delineation, zoning and acquisition. A principal objective of task three of the supplemental study is to develop improved legal, institutional and financial arrangements for preservation of the undeveloped flood plain. Pending completion of the study, the Commission recommends Federal legislation that would further broaden relevant National policy enunciated in the 1936 and subsequent flood control acts, and provide Federal assistance to the Basin states and localities for flood plain management. The Commission further recommends that such assistance be conditioned upon implementation of nonstructural measures for flood plain management, where feasible, prior to implementation of structural measures.

Agencies responsible for flood protection projects recommended in the Basin plan -- Beaver Brook, upstream watershed reservoirs, and local protection works -- should further consider the phasing of construction to permit any modification in project design, supplementary or alternative structural or nonstructural measures deemed necessary upon an evaluation of the project's role in Basinwide flood plain management.

ESTUARY

The Coordinating Committee report treats estuarine resource needs in insufficient detail to permit its use as a supporting document for individual agency project authorization reports. The Commission recommends the preservation of undeveloped coastal wetlands under study element 4, preservation of sites. The Commission recommends the preservation of salt marshes identified as sites requiring preservation in Appendix O of the Coordinating Committee report. The Commission further recommends that Basin management programs with potential impacts on estuarine resources -- including programs for water quality improvement, power plant construction, implementation of the proposed Connecticut River National Recreation Area, anadromous fisheries restoration, fish and wildlife enhancement, commercial navigation, flood plain zoning and other land use planning and regulation -- be considered in light of their estuarine benefits and costs. The estuarine effects of flood management alternatives will be assessed in the supplemental study.

The Commission incorporates by reference relevant findings and recommendations of the National Estuarine Pollution Study and National Estuary Study published in 1970 by the Department of the Interior. The Commission recommends that estuarine and related Basin management programs conform with the findings and recommendations of the Commission's current comprehensive coordinated long-range study of the water and related land resources of Long Island Sound. The Commission notes that the estuary will be studied in some detail in the Long Island Sound study. Relevant recommendations of State Coastal Management Legislation, an NERBC staff report published in 1970, are also incorporated by reference.

C. RECOMMENDATIONS FOR IMPLEMENTATION

General recommendations

1. The Commission recommends that its findings and recommendations be accepted as an element of the comprehensive, coordinated joint plan for its region, and, as modified by additional flood plain management and ecological studies in response to changing needs, be used as a basis for implementing action by all levels of government and by private individuals and institutions.

2. The Commission recommends that its findings and recommendations be used as a flexible guide for the development and evaluation of measures for management of the water and related land resources in the Basin. The Commission finds that the Basin plan is generally consistent with the findings of the North Atlantic Regional (NAR) water resources Type 1 framework study relative to resource needs in the Basin, and is also consistent with tentative findings of the Northeastern Water Supply Study (NEWS), with particular reference to proposed diversions of Connecticut River water to meet out-of-Basin water supply needs.

3. The Commission recommends that this report of its findings and recommendations be used as a supporting document for individual State and Federal agency authorization reports for Basin management projects.

4. The Commission recommends that its findings and recommendations be considered for adoption by the Basin States as an increment of Statewide water and related land resource plans.

Legal, institutional and financial arrangements for Basin resource management

1. The Commission endorses and urges full implementation of the Coordinating Committee's recommendation for continuing, cooperative Basin planning under the auspices of the Commission. The functions of the Commission's Connecticut River Basin Program (CRBP) include:

Overall management and coordination of the supplemental study program described in section E below; initiation, management and coordination of additional studies as needed.

Public information. The Commission will develop reporting mechanisms to enable Basin interests to take an informed and effective part in Basin resource management activities, including legislation and administrative actions at all levels of government.

Public education, to encourage resource management interests -- on their own initiative and out of a better understanding of the regional implications of individual decisions -- to accommodate their demands and expectations to the requirements of sound resource management.

Ongoing evaluations of existing programs. Task three of the supplemental study -- "analysis of legal, institutional and financial arrangements for flood protection and flood plain management" -- identifies areas of inquiry considered relevant to other resource management programs, including water quality, anadromous fisheries restoration, outdoor recreation and water supply. Special studies will be undertaken as necessary and appropriate.

Adoption of the Coordinating Committee's recommendation for the establishment of a Connecticut River Basin Program and Connecticut River Citizens Advisory Board within the Commission constitutes the Commission's principal recommendation for continuing the Commission's functions and for updating the Basin plan in accordance with section 204(4) of the Water Resources Planning Act.

2. Because the authorization of public programs without adequate financial, legal and institutional arrangements for their implementation is misleading and ultimately self-defeating, the Commission urges the Congress and the States to provide for such arrangements when authorizing elements of the 1980 Basin plan. Future Basin resource management plans recommended by the Commission, including a 1980 flood management plan, will recommend financial, legal and institutional arrangements necessary for implementation.

3. The Commission supports the organization within each Basin State of governmental powers and responsibilities to coordinate State, community and private resource planning for the portion of the Basin within each State, to provide for increased area representation in the planning process, and to participate in the allocation of Basin water and related land resources to meet both in- and out-of-Basin needs. Since the effectiveness of a Basinwide resource planning program will not be any greater than its effectiveness in any one State, such organizations - for example the kind of structure being studied by a special legislative commission in Massachusetts - are considered essential to achievement of the objectives of the Commission's Connecticut River Basin Program.

1980 costs and priorities

The Commission notes the extreme difficulty of assigning priorities among competing elements of the 1980 Basin plan for which needs have been thoroughly documented and are in almost all cases considered urgent. While the following table of costs and priorities lists elements of the plan in descending order of priority, all elements are assigned priority over proposals which are not a part of the plan and for which comparable planning support is lacking.

Resource management programs grouped under "land acquisition/controls" are a prerequisite in many cases to implementation of programs listed below and in part for this reason are given high priority. Programs are otherwise not conditioned upon prior implementation of programs listed above. For example, implementation of wastewater management proposals is not contingent upon completion of the supplemental study.

Plan elements are both broadly and narrowly classified and do not correspond to the 10 study element classifications utilized throughout the remainder of the report. However, it is intended that all study elements be included in the classifications adopted.

Economic and environmental planning criteria were a factor in the assessment of priorities. On the whole, however, it is not the Commission's intention to express its judgments about relative needs for environmental quality as opposed to economic development principally in this list, but rather to respond broadly to proposals, based on a mixture of economic and environmental considerations, by all participants in the field level investigation and its review.

The Basin's archeological, natural and historical sites identified in Appendix O of the Coordinating Committee report and recommended for preservation are considered priceless. A comparison of their worth with other elements of the plan is neither possible nor appropriate, and the preservation of sites is therefore not included in the Commission's assessment of priorities and costs.

A plan for meeting the Basin's future power needs will be developed as part of a larger study of alternative power generating technologies and sites in New England, and it is therefore not possible to indicate a comparative need for power generating facilities in the Basin at this time.

The Coordinating Committee's cost estimates are accepted as measures of the magnitude of the 1980 needs identified in the report. It is recommended that these and the following table of costs and priorities be utilized by public and private interests, including Congress and the State legislatures, for guidance in making investment decisions affecting Basin resource management.

New England River Basins Commission costs and priorities¹
for public investment - Connecticut River Basin
1980 Early Action Plan

<u>Priority</u>	<u>Cost (\$ millions)²</u>
supplemental study program	\$ 1
land acquisition/controls	
nonstructural flood plain management	100 ³
reservoir site acquisition	30
streambank acquisition	25
estuary land zoning/acquisition	10
National Recreation Area land zoning/acquisition	40
wastewater management	260
resource planning assistance, soil surveys and	27
resource conservation and development	
projects	
single and multiple purpose flood control structures	70
water supply	185
recreation	
National Recreation Area/Historic Riverway	80
urban recreational development	10
anadromous fisheries restoration	20
recreational navigation improvements	10
National Forest improvements	25
land treatment	33
wild and scenic rivers	25
commercial navigation improvements	5
118 identified upstream reservoir sites	<u>25</u>
Total (rounded)	\$ 280

¹Excluding the cost of the Commission's participation in the New England power plant siting study.

²Estimates are rounded, and are either based on or are compatible with price levels utilized by the Coordinating Committee.

³Costs for nonstructural flood plain management are subject to reassessment in the Commission's proposed supplemental study program.

D. FINDINGS AND RECOMMENDATIONS ON THE 2020 LONG-RANGE PLAN

The Commission recommends that continuing consideration be given to the findings of the Coordinating Committee with regard to potential means for meeting 2020 needs. It is emphasized that local flood protection measures are suggested for protection of existing developed areas within the flood plain, rather than for developments that would otherwise be restricted by implementation of recommended nonstructural measures for flood plain management. Implementation of potential measures to meet 2020 needs is subject to prior implementation of relevant Early Action Plan recommendations and to further evaluations of social, economic, environmental and other regional impacts. This applies with particular reference to major environmental alterations such as power plants, navigational improvements and reservoirs.

E. SUPPLEMENTAL STUDY PROGRAM

The following pages describe a study program for the Connecticut River Basin, to be carried out under the direction of the New England River Basins Commission under the authority of the Water Resources Planning Act of 1965. The proposed study is a supplement to the field level investigation conducted by the Coordinating Committee under authority of a Resolution of the Public Works Committee of the United States Senate dated May 11, 1962.

The proposed study will begin in Fiscal Year 1972 as quickly as study organization can be accomplished, and will be completed June 30, 1974. Total cost in new funding is estimated at \$700,000, including \$110,000 in FY 1972 funds which the U. S. House of Representatives, in its Public Works Appropriations bill for FY 1972, has appropriated for environmental studies of the 1980 Basin plan under the direction of the Water Resources Council.

Estimated costs for the study as a whole and for individual tasks are not suggested as measures of the total investment in environmental research needed in the Basin, but rather as a reflection, first, of levels of investment that are both necessary and appropriate to accomplish the specific study objectives, and, second, of the limit of Federal expenditures for specific study tasks that can realistically be expected under the Water Resources Planning Act in fiscal 1972-1974.

Costs of overall study management and coordination will be borne by the New England River Basins Commission out of its operating budget.

Plan of Study

Preparation of a plan of study will precede the study. Citizens and science advisory groups will participate with Connecticut River Basin Program (CRBP) staff and with study management teams in the:

identification and assessment of problems and needs;

determination of study objectives and scope; and

development of a study management plan indicating task assignments, costs and scheduling.

Study objectives and procedures will conform where necessary and appropriate to planning objectives and procedures adopted by the Commission for the preparation of a comprehensive, coordinated joint plan for the New England region as a whole. Plans of study adopted in 1971 for the Commission's Long Island Sound and Southeastern New England studies will be utilized as source materials.

Objectives

The study's primary objectives are:

To develop information on environmental-primarily ecological - characteristics, processes and values which will be useful for future decisionmaking in the Basin generally, and will be applied specifically in a reexamination of flood management alternatives (tasks one and four);

To formulate a flood management plan for the Basin, based on reexamination of the need for additional flood protection, analysis of legal, financial and institutional arrangements for plan implementation, and rigorous examination of the full range of environmental, social economic, engineering and other factors.

The environmental reconnaissance (task one) will be published for distribution to public and private agencies as a contribution to knowledge of the Basin's resources.

The recommended flood management plan, together with evaluations of regional impacts, will be transmitted to the Basin Governors, and through the Water Resources Council to the President and to the Congress, as an element of the 1980 Basin plan. It will be designed to assist the Congress, the Basin States, local governments and private interests to make informed decisions on flood management for the Basin, on the assumption that Federal and State agencies will develop projects to implement the plan.

Need for Study

Serious reservations have been expressed about various aspects of the Coordinating Committee report by individual citizens and citizen groups, local governments, political leaders and members of the scientific community. Prime areas of concern are: 1) that environmental information and values were not adequately reflected in developing resource management recommendations for the Basin; 2) that the report's conclusions and recommendations on flood management, involving an extensive set of major physical works, were not supported by adequately detailed analyses of flood risk, alternatives, or environmental effects.

In the absence of a study clarifying these issues, there is little prospect of consensus on the need for or preferred methods of providing additional flood protection. Areas subject to flood hazard will remain so. Potentially effective and acceptable flood control programs will remain unexplored in sufficient detail to permit informed judgment. In the event of serious flood conditions, solutions will be sought in a crisis atmosphere, quite possibly without opportunity for thoughtful consideration of environmental effects.

Scope

The study will produce an environmental sensitivity analysis or reconnaissance of the Basin's environmental characteristics, values and processes, both in general terms and with special reference to areas and values most likely to be affected by flood management decisions. The problem of flooding in the Basin will be reassessed, with particular reference to major potential damage centers and the need for additional protection. The study will consider alternative flood management methods and will produce a recommended flood management plan, taking into account both quantitative and qualitative, economic and environmental benefits

and costs, as these affect both specific project sites and the Basin as a whole.

Action recommendations will be presented on a level of specificity comparable to Study Element 10 of the Coordinating Committee report, "Flood Control and Multiple Purpose Reservoirs". Supporting analysis of alternatives will be presented in sufficient detail and in a format that will permit the exercise of independent judgment.

The study is organized into five tasks which are further broken down into appropriate subtasks. The five basic tasks are:

environmental reconnaissance of the Basin;

evaluation of the degree of additional flood protection needed;

assessment of legal, institutional, and financial arrangements for flood protection and flood plain management;

evaluation of flood management alternatives, with environmental and economic impact evaluations; and

plan formulation.

Each task will be coordinated with related Basin resource management research.

Management and organization

The study will be performed under the overall management and coordination of the Commission through staff employed by the Commission for its Connecticut River Basin Program. Appropriate Federal and State agencies will participate in their areas of responsibility and expertise. In addition to study leadership, NERBC will participate in all study phases through Commission staff and through private consultants. Beyond public meetings and hearings, direct public participation will be secured through a Citizen Advisory Board to the NERBC Connecticut River Basin Program. The scientific community will participate through a Science/Research Advisory Committee.

Each task will be executed by a study team led by an agency with appropriate responsibilities and expertise in the subject

of investigation. Actual performance of work may be by agency personnel, or by other agencies or private consultants, or a combination. Each team will receive policy guidance from the Commission. Personnel for performance of the study will be provided by the Water Resources Council, by member States and agencies of the Commission, by Commission staff, by consultants, by the Citizens Advisory Board, and by the Science/Research Advisory Committee, under the overall management and coordination of the Commission.

All reports on individual tasks and subtasks are to be prepared for the Commission as inputs to a plan ultimately to be formulated by all member states and agencies of the Commission, with the participation of the Citizens Advisory Board and the Science/Research Advisory Committee.

Task 1. Environmental reconnaissance of the Basin

Schedule: nine months - January 1-September 30, 1972.

Cost: \$135,000.

Description: A reconnaissance of environmental features of the Basin, with particular reference to aquatic ecosystems. Existing information will be assembled and evaluated and will be supplemented by field investigation. The reconnaissance will be directed at selected ecological characteristics, processes and values of the river system as a whole, with special consideration of specific river reaches and characteristics and processes most likely to be affected by alterations in river flows. Attention will be given to major ecosystems, life zones, special habitats, food chains, patterns of sedimentation and other factors that should be considered in planning alterations in river flows. Concentration on critical factors and selected river reaches should generate information useful to analysis of flood management alternatives within limits of schedules and funding.

Information on scenic, scientific, archeological and historic sites and recreation areas assembled by the Coordinating Committee will also be summarized in this task. However, emphasis is on ecological investigation.

Results will be used to assist in the evaluation of flood management alternatives in task four, but will be published in a format that will also permit their use in the evaluation of other resource management projects.

The development of a detailed ecological inventory and predictive model pertinent to all resource use decisions for the entire Basin is not included within the scope of this task. While a strong case has been made for the development of a detailed Basin-wide ecological model, a study of this magnitude would exceed not only the limits of the Water Resources Planning Act, as a vehicle for the authorization and funding of environmental research by river basins commissions, but also the objectives of the supplemental study. Techniques need to be developed and refined of predicting project impacts -- environmental, social, economic and other -- on the Basin as a whole. The Commission is therefore willing to cooperate with, and encourages cooperation among, research institutions and scientists in exploring alternative sources of funding and in developing suitable proposals for major research efforts in

addition to the supplemental study. The conduct of additional water and related land resources research in the Basin will be a primary function of the Connecticut River Basin Program. It is further emphasized that the environmental reconnaissance and other study tasks are to be coordinated with related studies that are separately managed and funded, and that the cumulative inputs and outputs of the total research effort will substantially exceed those of individual studies and study tasks.

Study management and organization: Task one will utilize the equivalent of six full time Federal agency and consulting personnel, with additional personnel from participating State agencies. The Department of the Interior will serve as lead agency, executed through the Regional Coordinator, Office of the Secretary, with policy guidance from the Commission. The Environmental Protection Agency (EPA) will also have a major role. A study management team will be assembled from qualified professional staff from appropriate agencies of the Department of Interior and of EPA, with emphasis on competence in aquatic ecosystems. The Commission will participate on the study management team, which will be advised throughout the conduct of this task by the Citizens Advisory Board and the Science/Research Advisory Committee. Illustrative areas of responsibility are as follows:

Organization of Task one results, preparation of report -
Department of the Interior.

Fish, wildlife and aquatic ecosystems; special environmental factors, unique natural scenic, historical and archeological features; outdoor recreation resources - Department of the Interior.

Water quality and public health - Environmental Protection Agency.

Special studies - New England River Basins Commission.

Task 2. Evaluation of need for additional flood protection

Schedule: six months - April 1, 1972-September 30, 1972.

Cost: \$90,000.

Description: An evaluation of the degree of additional flood protection needed, particularly at major urban and community damage centers. This task will include an examination of the Standard Project Flood as a decisionmaking tool in other river basins, with special attention to the Standard Project Flood on the Connecticut*. An analysis will also be made of the degree and effectiveness of existing flood protection systems in the Basin and of needs for additional protection in view of the extent and risk of potential loss of life and property and associated economic impairment. The analysis will be presented in sufficient detail and in a format that will permit the exercise of independent judgment.**

Study management and organization: Task two will utilize the equivalent of six full time professional positions, with additional personnel from participating State agencies. As outlined, the study management team will consist of personnel of the Water Resources Council, the U. S. Army Corps of Engineers, the Soil Conservation Service of the Department of Agriculture, appropriate Basin State agencies, and the Commission, with the Water Resources Council serving as lead agency. The Citizens Advisory Board and the Science/Research Advisory Committee will participate.

* The Standard Project Flood is not used in evaluating benefits of flood control projects.

** Funds allocated to this task include \$10,000 in each of the fiscal years 1972 and 1973 to cover costs of the Corps of Engineers in providing detailed information for a special study of flood plain management on a reach of the river between Holyoke and Hatfield. The special study, not a part of the supplemental study program, is being carried out by a consultant to the Corps of Engineers, Washington, as part of a research program directed at developing a revised methodology for consideration of flood plain management alternatives. The study will, in effect, constitute a direct contribution to the Supplemental Study.

This task is central to the supplemental study program, and is difficult to organize in ways that will fully utilize the special knowledge and competence of agencies which have intensively studied flood management problems in the Basin, and will also be generally accepted by Basin interests as objective. The organization proposed assumes that professional staff of the Council can be made available for leadership of this task.

An alternative approach would be to arrange for the National Academy of Sciences either to conduct or formally review and comment on this task. The NAS report on alternatives for water management in the Colorado Basin is a useful precedent.

As presently outlined, areas of responsibility are:

Examination of the concept and use of the Standard Project Flood generally and in the Connecticut Basin -- Water Resources Council.

Analysis of the degree of flood damage protection afforded in the Basin by natural storage, flood control structures, storage built for other purposes, flood plain regulation, flood proofing, flood warning and forecasting, etc. -- Water Resources Council, with Corps of Engineers, Soil Conservation Service, New England River Basins Commission.

Analysis of alternative levels of protection and risk as a basis for formulation of flood management program, organization of study results and preparation of report -- Water Resources Council, with New England River Basins Commission.

Task 3. Analysis of legal, institutional and financial arrangements for flood protection and flood plain management

Schedule: nine months - April 1, 1972-December 31, 1972.

Cost: \$50,000.

Description: An assessment of the adequacy of existing mechanisms for the administration and financing of flood hazard area management and flood damage reduction in the Basin. The objective of this task is to provide bases for assessing the feasibility of implementing alternative flood management programs identified in Task 4 and for recommending legal, institutional, and financial changes necessary to implement the recommended plan in Task 5. It will consist of:

a broad examination of existing Federal, State and local laws, institutional arrangements and programs for flood protection and flood plain management, as these affect the range of effective choice of flood management in the Basin;

a more detailed assessment of existing and desirable State and local flood plain regulation authority and activities in the Basin (a Commission study, Flood Hazard Area Management for New England, * is relevant); and

a more detailed evaluation of Federal-State-local cost-sharing arrangements for both structural and nonstructural programs for flood protection and flood plain management in the Basin.

Study Management and organization: Task three will be performed by a consultant or consultants to the Commission, with the cooperation and assistance of agencies with relevant responsibilities and functions. The Citizens Advisory Board and the Science/Research Advisory Committee will participate.

* Prepared for the Commission by Anderson-Nichols & Company, Inc. (1970).

Task 4. Evaluation of flood management alternatives

Schedule: 15 months - October 1, 1972-December 31, 1973.

Cost: \$375,000.

Description: A simultaneous evaluation of structural and nonstructural flood management alternatives designed to meet flood protection needs established in Task two will be undertaken from three perspectives:

- a) from the standpoint of the minimization of flood losses, in which engineering and hydrologic factors will be a prime consideration;
- b) from the standpoint of environmental factors, in which ecological, aesthetic and recreational values and land use patterns are a prime consideration; and
- c) from the standpoint of economic factors, in which economic impacts on communities and the region are a prime consideration.

Both quantitative and qualitative benefits and costs of alternatives will be evaluated. Results of Tasks one, two, and three are basic inputs to all evaluations. The special Corps-funded flood plain study in Massachusetts will be utilized. The Citizens Advisory Board and the Science/Research Advisory Committee will participate. Results will be utilized in the formulation of a flood management plan in Task five, and will be presented in sufficient detail and in a format that will permit the exercise of informed independent judgment.

Alternatives will be evaluated with reference to major damage centers with and without existing flood protection works, and to major flood prone land areas presently undeveloped or sparsely settled.

Because flood control and multiple purpose reservoirs and upstream watershed flood control projects were the subject of intensive analysis by the Coordinating Committee, this task will focus on alternatives which received less intensive study, in order to provide a uniform quality of analysis of the various alternatives.

The following alternatives will receive intensive analysis in combination as well as singly:

local protection works, including the possibility of raising existing dikes and walls and constructing new works, and an assessment of the loss of natural Basin storage and concomitant increase in flood stages and damages that result downstream from building new dikes and walls in natural flood storage areas;

nonstructural measures, including flood plain regulation; acquisition in fee or less than fee of certain flood hazard areas; possible acquisition and removal of flood-threatened structures from the flood plain; flood forecasting/warning; and flood proofing. Serious consideration will also be given to flood insurance programs among flood management alternatives evaluated in task four; and

potential use of existing storage and storage sites, especially private main stem power reservoirs whether or not subject to imminent relicensing, including the prospect of raising existing power dams or buying storage from power companies.

Major flood control and multiple purpose reservoirs recommended by the Coordinating Committee are specifically included within the scope of this task. These include Blackledge and Cold Brook, recommended for State implementation, in Connecticut, and the following Corps projects: Meadow, in Massachusetts; Bethlehem Junction, Claremont and Honey Hill, in New Hampshire; and Gaysville and Victory, in Vermont. Upstream watershed projects including flood control reservoirs are generally included within the scope of this task; however, reevaluation of individual projects will be limited to major reservoirs that would be constructed by the Corps of Engineers. An evaluation of alternatives to individual upstream watershed projects is proposed only where environmental factors are involved which are of sufficient importance to warrant evaluation.

A first subtask will involve evaluation of alternatives from the standpoint of minimizing potential flood losses -- to lives and property, to property values, to community tax bases and expansion opportunities, and related losses. Both quantitative and qualitative factors will be taken into account, including engineering and hydrologic constraints and feelings of security and well-being.

A second subtask will evaluate environmental implications of alternative flood management measures singly and as a system for project sites and for the Basin as a whole, as a basis for the selection

of alternatives, with particular reference to the effects of alterations of river flow. Ecological factors taken into account will include indicator organisms, special habitats, stream siltation and erosion patterns and ecologically sensitive areas. Other factors include scenic, historic and recreational values, and community and regional land use patterns.

A third subtask will consist of an evaluation of economic impacts, including the relative effect of alternative flood management measures on employment, personal income, private investment in new or expanding industrial development, and tax revenues.

It is emphasized that subtask three is to be distinguished from benefit-cost analysis to determine the dollar-value return on investments in water resources projects. Benefits and costs in all three evaluations will be assigned dollar or other valuations considered necessary and appropriate to provide an adequate basis for plan formulation. Citizens participation in the identification and use of appropriate measurements of value will be essential; the roles of citizens and science advisory groups are described below.

The implications of alternative population and economic growth projections will be considered in the evaluation of alternatives. Specific consideration will be given to the OBERS* projections.

* Economic Activity in the United States by Water Resource Regions and Subareas, Historical and Projected, 1929-2020 (OBERS report) (draft), prepared by the U. S. Department of Commerce, Office of Business Economics, Regional Resources Division, and the U. S. Department of Agriculture, Economic Research Service, National Resource Economics Division, for the Water Resources Council, four volumes (Washington, 1971). It is stated in the draft OBERS report that:

The OBERS projections are presented as meaningful baseline or reference series for the analysis of resource demands, development requirements, and potential costs and benefits. They in no way restrict planning groups from full consideration of alternative rates and patterns of economic growth. Actually, the usefulness of planning endeavors would be enhanced by an adequate consideration of alternative sets of projections. The OBERS projection system is available for use by the Water Resources Council and its member agencies in the development of alternative projections.

Alternatives will be evaluated within the context of constraints imposed by the 1980 Basin plan, in the form of recommendations concerning water quality, minimum flow releases from existing dams, navigation and other related resource management programs.

Study management and organization: The evaluation of flood management alternatives will utilize the equivalent of 10 full time Federal agency and consulting personnel, with additional personnel from participating State agencies. Task four will require the performance of three separate subtasks concurrently by separate but interacting task groups. Overall coordination and policy guidance will be provided by the Commission. Task group composition and principal areas of responsibility are preliminarily identified in the following paragraphs.

Subtask one: Evaluation of alternatives from standpoint of minimizing flood losses

This task will cost approximately \$170,000 and will utilize the equivalent of five fulltime Federal agency and consulting personnel, with additional personnel from participating State agencies. The task group will consist of personnel of the U. S. Army Corps of Engineers, the Soil Conservation Service of the Department of Agriculture, the Federal Power Commission, the National Weather Service of the Department of Commerce, appropriate Basin State agencies, and the New England River Basins Commission, as lead agency. Areas of responsibility are identified as follows:

Organization of study results and report preparation --
New England River Basins Commission.

Analysis of local flood protection works as an alternative to flood storage including the possibility of raising existing dikes and walls and of providing more extensive new local protection works than recommended in the Coordinating Committee report; organization of study results and report preparation -- Corps of Engineers.

Analysis of nonstructural alternatives, including flood plain regulation, acquisition, clearance, flood forecasting/ warning, insurance and flood proofing -- New England River Basins Commission and Corps of Engineers.

Analysis of the potential use of existing storage and storage sites -- Corps of Engineers and Federal Power Commission.

Reanalysis of flood control and multiple purpose Corps of Engineers and Public Law 566 upstream watershed reservoirs considered by the Coordinating Committee, in the light of findings of Task two concerning need for additional flood protection -- Corps of Engineers, Soil Conservation Service and National Weather Service.

Subtask two: Evaluation of alternatives from standpoint of environmental effects

The evaluation of environmental impacts of alternative flood control measures will cost approximately \$170,000 and will utilize the equivalent of five full time Federal agency and consulting personnel with additional personnel from participating State agencies. The Department of the Interior will serve as lead agency, executed through the Regional Coordinator, Office of the Secretary, with policy guidance from the Commission. The task group will consist of personnel from appropriate agencies of the Department, the Environmental Protection Agency, appropriate Basin State agencies, and the New England River Basins Commission. Assignments of responsibility derive from those for the environmental reconnaissance (Task one) to insure continuity in environmental evaluations, i. e.:

Organization of study and preparation of report -- Department of the Interior, Office of the Regional Coordinator.

Analysis from standpoint of fish and wildlife and aquatic ecosystems, natural, historical and archeological features, maintenance of rural environmental setting, and outdoor recreation resources -- Department of the Interior.

Analyses from standpoint of environmental pollution and public health -- Environmental Protection Agency.

Analysis from standpoint of community and regional land use patterns -- New England River Basins Commission.

Subtask three: Evaluation of economic impact

The evaluation of economic impacts of alternative flood control measures will cost approximately \$30,000 and will utilize the equivalent of two full time Federal agency members. The task group will consist of personnel of the Office of Business Economics of the Department of Commerce and the Economic Research Service of the Department of Agriculture. The Office of Business Economics will serve as lead agency.

Task 5. Plan formulation

Schedule: 6 months - January 1, 1974-June 30, 1974.

Cost: \$50,000.

Description: Formulation of a plan for structural and/or nonstructural flood protection measures especially for major urban damage centers and major flood-prone areas presently sparsely settled or undeveloped, with action recommendations at a level of specificity comparable to the Coordinating Committee's 1980 Early Action Plan for reservoir construction. The recommended plan will represent the judgment of the Commission concerning the need for additional flood protection in the Basin and the development of an optimum flood protection system through the most effective and appropriate legal, institutional and financial means. It will be based upon the results of the preceding four tasks, and upon the individual and combined judgment of those participating in the study, including the Commission, its member States and agencies, consultants, the Citizens Advisory Board and the Science/Research Advisory Committee.

The flood management plan will represent the final product of the supplemental study program, for which the reports of the preceding four tasks will serve as appendices. The report with appendices, after review and evaluation by the Commission, the Citizens Advisory Board and the Science/Research Advisory Committee, and formal review prescribed by the Water Resources Planning Act, will be transmitted to the Water Resources Council as a supplement to the 1980 Basin Plan approved by the Commission, and will serve as a flexible guide for future Basin flood management and as a supporting document for agency authorization reports. Follow-on recommendations for additional studies, review and evaluation, and program priorities will be developed as necessary by the Commission through the Connecticut River Basin Program.

Study management and organization: This task will cost approximately \$50,000 and will utilize the equivalent of three full time Federal agency and/or consulting personnel. The New England River Basins Commission will perform this task with the assistance of the agencies contributing to the preceding tasks and of the Citizens Advisory Board and the Science/Research Advisory Committee. Report preparation will be the responsibility of the Commission staff.

Participation by citizens and the scientific community

The Commission will establish citizens and science advisory groups for the Connecticut River Basin Program, in recognition of the clear need for intensive involvement of citizens interests and the scientific community in natural resource planning generally and specifically in Connecticut River Basin planning. The first assignment of these groups will be to participate in the supplemental study program.

Considerations described in the following paragraphs will guide the organization and use of the Connecticut River Basin Citizens Advisory Board (CAB) and Science/Research Advisory Committee (S/RAC).

Objectives

CAB: CAB's long-term objective will be to participate with the Commission in the formulation of resource management plans for the Basin that are responsive to public needs and preferences in affected areas both in and outside of the Basin. Its short-term objective is to participate with the Commission in the formulation of a flood management plan for the Basin that responds to public needs and preferences among structural and nonstructural flood management alternatives.

S/RAC: S/RAC's long-term objective will be to assist the Commission in the development and use of advanced resource planning methodologies and the organization for this purpose of research capabilities from available sources both in and outside of the Basin. Its short-term objective is to participate with the Commission in the development and implementation of suitable methodologies for the supplemental study as a whole and for each study task.

Functions

CAB: CAB's advice will be sought in the development and implementation of plans of study for the study as a whole and for each task. CAB's primary function will be to participate in the evaluation of flood management alternatives and in plan formulation (tasks four and five), by expressing preferences among alternatives according to their contribution to environmental, economic, public

safety or other identified planning criteria.* CAB will review interim and final reports for each task.

S/RAC: S/RAC's advice will be sought in the development and implementation of plans of study for the study as a whole and for each task, specifically in the refinement of task descriptions, in the organization of study management teams or task groups, in the identification of tasks requiring the assistance of independent consultants, and in the development of procedures for the selection of consultants. It will advise study management teams on procedural matters, including information retrieval and analysis and techniques for measuring beneficial and adverse impacts of flood management alternatives. S/RAC will also assist in coordinating the study with related research. The Commission, as noted, will cooperate with the scientific community in efforts to organize and fund necessary research for the development of a detailed ecological model of the Basin.

S/RAC will provide an independent, professional forum for discussion -- and, if possible, reconciliation -- of issues concerning study methodology and results that may arise within the scientific community.

Generally: The Commission will request CAB and S/RAC comments on interim task reports identifying major issues and relevant points of view on each task report. Lead agencies will be instructed to give explicit consideration to these comments in the preparation of task reports; comments will be appended to the final report for transmittal to the Water Resources Council and to the Basin States.

The Commission will prepare guidelines for use by lead agencies in securing CAB and S/RAC participation in each task. Guidelines will be derived in part from relevant recommenda-

*"The (Citizens Review) Committee should not be expected to undertake technical analyses or to evaluate the technical accuracy of staff reports. Perhaps the single most important function of the Committee is to evaluate alternative measures for achieving desired goals." "Citizens Review Committee - An Evaluation," CRC report, A I-3.

tions of CRC. *

CAB and S/RAC will be encouraged to adopt operating procedures best suited to their needs, in cooperation with one another and with study management teams, and based in part on experience with citizens and science advisory participation in the field level investigation and in other Commission studies.

Membership

CAB: The appointment of CAB's membership will be shared by the Basin Governors and the Commission Chairman, and will be guided principally by these criteria:**

balanced representation of all participants in the allocation of the Basin's resources for flood management, with emphasis on those concerned with the management of important environmental resources (e. g. estuary, flood plain, etc.) and occupants of flood hazard areas, both protected and unprotected;

balanced representation of citizens interests in conservation, development and public safety; related resource uses; affected watersheds and political/planning subdivisions; and affected social and economic interests, in part to

*CRC recommended that a citizens advisory group be launched early "with a thorough briefing on the history of plan development and related studies. The briefing should clarify the nature of constraints imposed on the planners, the major issues confronted (or not confronted) to date, and the decisions already made (or not made)." CRC also recommended that progress reports "contain an element responding specifically to the citizen review comments elicited by the preceding report" and that they be released to CAB "as they become available for review and comment." (CRC report, III - 1-2; A I).

**CRC recommended that CAB "be large enough to provide reasonable representation of geographic areas and of the major groups concerned with the Basin's resources. In this connection, the two members per State suggested for a Citizens Advisory Board in the Connecticut River report appears to be inadequate." (CRC report, A-1).

assist in determining equitable distributions of flood management benefits and costs;

equal representation of the Basin States;

out-of-Basin representation, large enough to provide strong adversary discussions where interest conflicts exist in order to insure that committee reports produce balanced views; and

representation of governmental planning, conservation or similar jurisdictions, provided that such organizations have no project development responsibilities or other interests that could conflict with an objective evaluation of flood management proposals in the public interest.

Anticipating the Connecticut River Basin Program and the need for continuity between citizens participation in the preparation of the 1980 Basin plan and the new program, the Commission organized an interim CAB upon the completion of CRC's assignment February 1, 1971. The interim CAB consisted of CRC members who volunteered to comment on the Commission's draft findings and recommendations on the Coordinating Committee report and was chaired by Professor Bernard B. Berger, who served as CRC Moderator. The interim CAB's statement on the July 12 draft 1980 Basin plan recommended by the Commission, dated September 8, is included in the text of comments appended by reference to this report.

The Commission acknowledges the contributions of CRC and its successor, the interim CAB, and also acknowledges some members' offer to serve as needed in the future. The Commission concurs in CRC's recommendation that, "In the light of the growing experience of CRC members with the CRBS (Connecticut River Basin Study) proposals, and in the interests of continuity, " consideration should be given to including some CRC members on CAB.

SRAC: S/RAC membership will be appointed by the Commission Chairman in consultation with lead agencies of the various study management teams. Lead agencies will in turn consult team member agencies. Other sources will also be consulted, including the Basin Governors, the Council of Water Resources Research Centers, professional/academic associations, universities and other research-related institutions.

S/RAC membership will represent research capabilities relevant to specific study tasks, with particular emphasis on environmental evaluations of flood management alternatives. The combination of skills will be reoriented according to the subject of future studies conducted as part of the continuing Connecticut River Basin Program. Membership will not be restricted to Basin scientists, although it is anticipated that Basin academic and other research-related institutions will be capable of supplying many if not most S/RAC members. The Commission feels that the concept of a "Basin scientific community" should complement rather than substitute for the use of scientific expertise in a broader sense, encompassing scientists and institutions whose voices and capabilities have not yet been recognized as well as those that have. CAB will be requested to submit nominations, to insure representation of scientific interpretations of resource management needs that might be better recognized publicly than professionally or officially.

Generally: CAB and S/RAC membership will generally be coterminous with special studies such as the supplemental study, with provision for replacement at the request of CAB and S/RAC chairmen for cause. Consideration is being given to the organization of citizens and science advisory committees to the Commission as a whole, to which the chairmen of advisory committees for each of the Commission's special studies would be appointed ex officio. Staff support to all advisory committees will be provided by the Commission.

Chairman

CAB: The Commission is mindful of CAB's special role in the Basin planning process and the need to establish and maintain a relationship between CAB and study management teams that will protect CAB's freedom to express a range of citizens' interests. Election of CAB's chairman by the membership -- after appropriate consideration under the leadership of an interim chairman -- is considered a desirable and practicable means of meeting this need.

S/RAC: The Chairman of S/RAC will be appointed by the Commission Chairman after consultation with the Basin Governors and Commission member agencies.

Coordinated Budget Estimates*
Supplemental Connecticut River Basin Studies

Table 1. Funding by Task
Total

Task	Agency	Estimated Cost	Fiscal Year		
			1972	1973	1974
1	Department of the Interior	85,000	35,000	50,000	
	Environmental Protection	20,000	10,000	10,000	
	Agency ^{1/}				
	NERBC ^{1/}	30,000	15,000	15,000	
	Subtotal	135,000	60,000	75,000	
2	Water Resources Council	25,000	10,000	15,000 ^{2/}	
	Corps of Engineers	45,000	20,000 ^{2/}	25,000 ^{2/}	
	Soil Conservation Service	10,000	5,000	5,000	
	NERBC	10,000	5,000	5,000	
	Subtotal	90,000	40,000	50,000	
3	NERBC ^{1/}				
	Subtotal	50,000	10,000	40,000	
4	<u>Subtask 1</u>				
	Corps of Engineers	70,000		50,000	20,000
	Soil Conservation Service	40,000		30,000	10,000
	Federal Power	15,000		5,000	10,000
	Commission				
	National Weather Service	20,000		15,000	5,000
	NERBC	30,000		20,000	10,000
	Subtotal	175,000		120,000	55,000
	<u>Subtask 2</u>				
	Department of the Interior	110,000		75,000	35,000
	Environmental Protection	40,000		30,000	10,000
	Agency				
	NERBC	20,000		10,000	10,000
	Subtotal	170,000		115,000	55,000
	<u>Subtask 3</u>				
	Office of Business	20,000		5,000	15,000
	Economics				
	Economic Research	10,000		5,000	5,000
	Service				
	Subtotal	30,000		10,000	20,000

Table 1. Funding by Task (continued)

Task	Agency		Total Estimated Cost	Fiscal Year		
				1972	1973	1974
5	NERBC ^{1/}					
		Subtotal	50,000 ^{3/}			50,000 ^{3/}
TOTAL PROGRAM			700,000	110,000	410,000	180,000

^{1/} for NERBC participation in specific tasks. NERBC costs as study leader borne by its operating budget.

^{2/} includes \$10,000 each year for logistical support of a demonstration floodplain study to be carried out by a private consultant under contract to the New England Division, Corps of Engineers.

^{3/} includes amounts for reimbursement to other agencies for participation in plan formulation not realistically allocable at this time.

* As included in the Commission's budget request for Fiscal Year 1972. Following submission of these estimates to the Water Resources Council September 2, it was understood that leadership of task two would not be assumed by the Council. Approximately \$20 thousand will be allocated to the Department of Housing and Urban Development (HUD) out of funds budgeted for the Commission to finance HUD's participation in the evaluation of flood management alternatives.

Coordinated Budget Estimates *
Supplemental Connecticut River Basin Studies

Table 2. Agency funding (in thousands of dollars)

<u>Agency</u> _____	<u>Method</u> <u>of Finan-</u> <u>cing</u>	<u>Estimated</u> <u>Total</u> <u>Cost</u>	<u>Fiscal Year</u>		
			<u>1972</u>	<u>1973</u>	<u>1974</u>
Water Resources Council	Direct	25	10	15	--
Department of Agriculture		60			
Soil Conservation Service	Trans-	(50)	5	35	10
Economic Research Service	fer from	(10)	--	5	5
	WRC				
Corps of Engineers	"	115	20	75	20
Department of Commerce		40			
National Weather Service	"	(20)	--	15	5
Office of Business	"	(20)	--	5	15
Economics					
Environmental Protection Agency	"	60	10	40	10
Federal Power Commission	"	10	--	5	10
Department of the Interior	"	195	35	125	35
New England River Basins Commission	"	195	30	90	70
TOTAL PROGRAM		<u>700</u>	<u>110</u>	<u>410</u>	<u>180</u>

* See footnote to Table 1.

Coordinated Budget Estimates
Supplemental Connecticut River Basin Studies

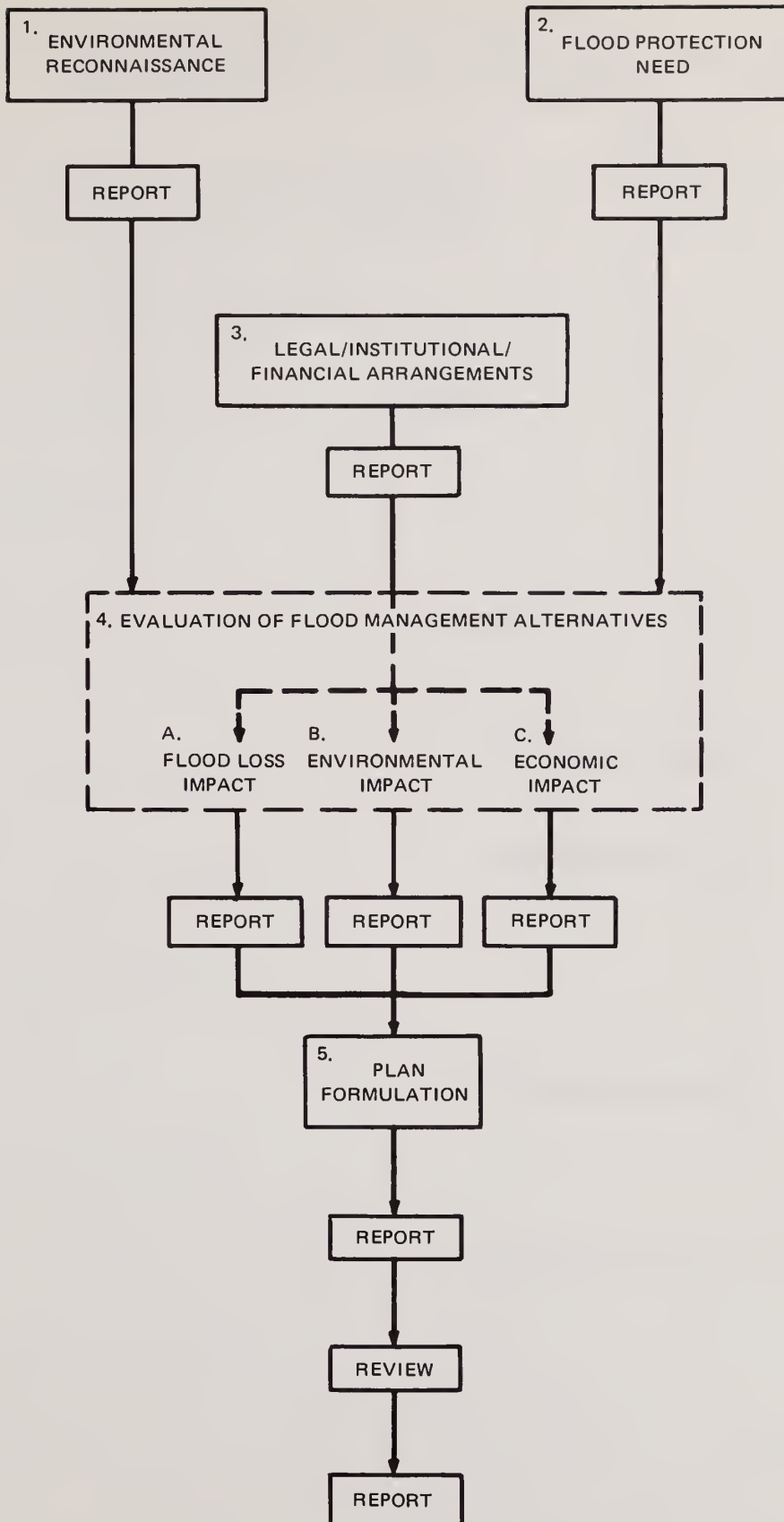
Table 3. Funding by study functions (in thousands of dollars)

Function	Estimated	Fiscal Year		
	Total Cost	1972	1973	1974
1. Management and Coordination	NERBC OPERATING BUDGET			
a. General management and coordina- tion (meetings, travel, etc.)				
b. Scheduling and budgeting				
c. Public involvement				
2. Plan of Study	NERBC OPERATING BUDGET			
a. Identify and assess problems and needs				
b. Determine study objectives and scope.				
c. Develop study management plan indicating task assignments, costs and scheduling.				
3. Field Work	350			
a. Further evaluation and delineation of problems, needs, goals	(50)	20	30	
b. Evaluate resource capabilities	(300)	90	210	
4. Plan Formulation	250			
a. Develop first cut of possible alternative plans and projects for all objectives. *	--	--	--	--
b. Analyze alternative plan relation- ships (augmenting, conflicting, identifying trade-offs)	(200)		140	60
c. Review and select plan components for single or multiple objectives (may be necessary to revise Plan of Study and repeat 3 and 4 above)	(50)			50

Table 3. Funding by study functions (in thousands of dollars) - (cont.)

Function	Estimated Total Cost	Fiscal		
		1972	1973	1974
5. Report Preparation	70			
a. Writing, illustrating, editing	(30)		5	25
b. Printing	(25)		5	20
c. Review	(15)		5	10
6. Contingencies	30		20	10
TOTAL PROGRAM	<u>700</u>	<u>110</u>	<u>410</u>	<u>180</u>

*Completed by the Connecticut River Basin Coordinating Committee.



**PROPOSAL OUTLINE
CONNECTICUT RIVER BASIN SUPPLEMENTAL STUDY PROGRAM
NEW ENGLAND RIVER BASINS COMMISSION**

YEARS

[illegible]

APPENDICES

RECOMPUTATIONS OF BENEFITS AND COSTS
OF
MAJOR RESERVOIRS BASED ON 5 1/8 PERCENT INTEREST RATE*

Projects	Total First Costs (\$1,000)	Total Benefits	Total Annual Charges	Benefit Cost Ratio
NEW HAMPSHIRE				
Bethlehem Junction	16,000	1,301	995	1.3
Claremont	20,910	1,429	1,294	1.1
Beaver Brook ^{1/}	1,660	268.9	96.8	2.8
Honey Hill	11,100	2,302	713	3.2
VERMONT				
Victory	6,600	561	456	1.2
Union Village ^{2/}	1,300	233	86	2.7
Gaysville	31,600	2,649	1,942	1.4
MASSACHUSETTS				
Meadow ^{2/}	41,400	2,673	2,521	1.1
Tully ^{2/}	18,700	2,071	1,508	1.4
Gardner	4,070	338	283	1.2
Knightville ^{2/}	4,400	680	265	2.6
CONNECTICUT				
Cold Brook	4,700	710	315	2.3
Blackledge	18,300	2,096	1,133	1.8

*By the New England Division, Corps of Engineers. This is a modification of table VIII-5 of the Coordinating Committee Main Report, p. VIII-29.

^{1/} Based on 4 7/8 percent interest rate. The modified interest rate is not applicable to authorized projects currently under design.

^{2/} For modification of an existing Corps of Engineers reservoir.

RECOMPUTATIONS OF BENEFITS AND COSTS
OF
UPSTREAM WATERSHED PROJECTS
BASED ON 5 1/8 PERCENT INTEREST RATE*

ITEM 1

The Water Resources Council has advised that the interest rate to be used in river basin evaluations for fiscal year 1971 is 5-1/8 percent. The following shows the effect of this interest rate on evaluation of the early action program.

1. The eight watersheds currently being planned (described in Summary, page F-9; Chapter VII, Table 66; and Chapter IX, page 286) will have annual costs increased from \$957,500 to \$1,002,500. Annual benefits will increase from about \$1.43 million to about \$1.44 million.
2. The nine additional potential watershed projects (described in Summary, page F-9; Chapter VII, Table 67; and Chapter IX, page 287) will have an increase in annual costs from \$949,400 to about \$995,600. Annual benefits will increase from about \$973,700 to about \$980,700.
3. The 118 sites outside of potential watershed projects will have increases in total annual costs from about \$3.7 million to \$3.9 million. Although not evaluated, redevelopment benefits will bring increases in total annual benefits (Chapter IX, page 287).
4. Comparison of individual watersheds is made in the attached tables.

The amortization factor for 100 years at 5-1/8 percent is 1.049 times that for 4-7/8 percent. With operation and maintenance costs remaining the same, this adjustment in annual costs became 1.046 times the cost at 4-7/8 percent.

Since redevelopment benefits are based on amortization of the portion of installation costs allocated to local labor, these benefits increased.

The overall effect on benefit-cost ratios is minor.

ITEM 2

This revision also changes fish and wildlife benefits shown in Appendix F to reflect as nearly as possible benefits based on data shown in Appendix G.

The changes shown below involve each of the following three categories included in the USDA early action plan (needed within the next 10-15 years).

*By the U. S. Department of Agriculture, Soil Conservation Service.
Appendix F of the Coordinating Committee report is modified accordingly.

1. Upstream Watershed Projects Currently Being Planned Under Public Law 566

Fish and Wildlife Net Annual Benefits

Watershed Name	Reservoir Fishing (dollars)	Stream Fishing		Waterfowl (dollars)
		Miles Benefitted	Dollars	
Sugar River	19,100	-	-	-
Indian Brook	-	-	-	-
Gale River	-	-	-	-
Blow-Me-Down Brook	-	-	-	-
Indian-Mascoma River	21,400	-	-	1,400
Wells River	-	-	-	-
N. Br. Westfield R.	117,700	53.7	19,800	2,200
Upper Quaboag (Work Plan Supp. #3)	2,000	21.1	17,400	-
Total*	160,200	74.8	37,200	3,600

* Combined total fish and wildlife benefits = \$201,000.

2. Potential Upstream Watershed Projects

Fish and Wildlife Net Annual Benefits

Watershed Name	Reservoir Fishing (dollars)	Stream Fishing		Waterfowl (dollars)
		Miles Benefitted	Dollars	
Mohawk River	-	-	-	-
Upper Ammonoosuc River	-	21.6	-	-
Passumpsic-Moose River	-	36.5	-	900
Black River	-	-	-	-
Ball Mountain Brook	17,600	10.7	1,300	-
Whetstone Brook	24,000	9.9	2,900	-
N. Br. Deerfield River	8,700	26.6	5,200	-
E. Br. North River	8,800	17.7	1,300	-
Mill River	26,600	-	-	800
Total*	85,700	123.0	10,700	1,700

* Combined total fish and wildlife benefits = \$98,100.

3. Other Potential Water Impoundments (118 sites)

a. Fish and wildlife net annual benefits

(1) Reservoir fishing	\$2,629,000
(2) Stream Fishing (675 miles benefitted)	542,000
(3) Waterfowl	<u>33,000</u>

Combined total fish and wildlife benefits \$3,204,000

These adjustments in fish and wildlife benefits do not adversely effect the feasibility of watershed projects or sites proposed in the USDA early action plan.

COMPARISON OF BENEFITS AND COSTS^{1/}
WATERSHEDS CURRENTLY BEING PLANNED
AT INTEREST RATES OF 4-7/8 AND 5-1/8 PERCENT, 100 YEAR PROJECT LIFE
(Dollars) ^{2/}

Watershed Number	Watershed Name	4-7/8 percent ^{3/}			5-1/8 percent		
		Total Annual Benefits	Total Annual Costs	Benefit- Cost Ratio	Total Annual Benefits	Total Annual Costs	Benefit- Cost Ratio
NH16	Sugar River	449,800	233,900	1.9:1.0	454,000	245,300	1.8:1.0
NH6	Indian Brook	17,800	13,700	1.3:1.0	18,000	14,400	1.3:1.0
NH10A2	Gale River	61,300	88,000	0.7:1.0	62,300	92,300	0.7:1.0
NH14A	Blow-Me-Down Brook	19,400	29,800	0.6:1.0	19,800	31,200	0.6:1.0
NH13	Indian-Mascoma River	150,900	130,000	1.2:1.0	152,800	136,000	1.1:1.0
VT8	Wells River	95,800	100,400	1.0:1.0	97,700	105,000	0.9:1.0
ML4B2	West Branch, Westfield R.	634,900	361,700	1.8:1.0	634,900	378,300	1.7:1.0
	TOTALS	1,429,900	957,500	1.5:1.0	1,439,500	1,002,500	1.4:1.0

^{1/} The Upper Quaboag Watershed includes a supplementary work plan which adds two sites and modifies the purpose and storage capacity of three sites in the original work plan. Additional benefits will be provided above those shown in Table 47; however, as of the date of this appendix final determination has not been made.

^{2/} Adjusted Normalized Prices.

^{3/} From Table F-66.

COMPARISON OF BENEFITS AND COSTS
POTENTIAL UPSTREAM WATERSHED PROJECTS
AT INTEREST RATES OF 4-7/8 AND 5-1/8 PERCENT, 100 YEAR PROJECT LIFE
(Dollars) 1/

Watershed Number	Watershed Name	4-7/8 percent <u>2/</u>			5-1/8 percent		
		Total Annual Benefits	Total Annual Costs	Benefit-Cost Ratio	Total Annual Benefits	Total Annual Costs	Benefit-Cost Ratio
NH2	Mohawk River	91,800	72,700	1.3:1.0	92,300	76,000	1.2:1.0
NH5	Upper Ammonoosuc River	159,000	160,000	1.0:1.0	160,100	167,400	0.9:1.0
VT6A, B	Passumpsic-Moose Rivers	259,200	224,000	1.2:1.0	260,700	234,300	1.1:1.0
VT15A1	Black River	90,500	144,000	0.6:1.0	91,400	150,600	0.6:1.0
VT19A1	Ball Mountain Brook	52,000	51,000	1.1:1.0	52,200	53,300	1.0:1.0
VT20	Whetstone Brook	99,400	88,900	1.1:1.0	100,000	93,300	1.1:1.0
VTM4A2	North Branch, Deerfield R.	108,700	105,500	1.1:1.0	109,200	110,300	1.0:1.0
VTM4E1	East Branch, North River	12,400	9,000	1.4:1.0	13,700	11,800	1.2:1.0
M9	Mill River	100,700	94,300	1.1:1.0	101,100	98,600	1.1:1.0
TOTALS		973,700	949,400	1.1:1.0	980,700	995,600	1.0:1.0

1/ Adjusted normalized prices.

2/ From Table F-67.

FACT SHEET FOR THE CONNECTICUT VALLEY
URBAN PILOT PROJECT*

10/22/71

The Connecticut Valley Urban Project is one of six urban pilot projects undertaken by the Geological Survey in order to demonstrate the use of geology and hydrology in the decision making process required in regional urban development. All of these studies are being made on a regional basis. The Connecticut Valley Urban Pilot Project area extends from latitude 43° in the vicinity of Brattleboro, Vermont, and Keene, New Hampshire, southward to Long Island Sound, between latitude 72° , $7\frac{1}{2}$ -minutes, and 73° . This encompasses approximately 5,000 square miles and includes about one hundred $7\frac{1}{2}$ -minute quadrangles. As part of this program, grants-in-aid are made to state geologists to be matched in services directly related to the completion of project objectives. The State Geologist is expected to coordinate his activities with other state agencies, such as state, regional, and local planning office, water resources commissions, etc., that are directly involved in making decisions relative to land use and environmental problems. In FY-1971 Connecticut Valley Urban Pilot Project was funded at a level of \$100,000, in FY-1972 at a level of approximately \$200,000. The initial funding has been for a feasibility study, using as a basis existing geologic mapping prepared under State Cooperative and Survey programs, as well as by State agencies. The project design calls for completion of this study in about 5 years at a much greatly increased rating of funding.

*Supplied by the U. S. Department of the Interior, Geological Survey,
80 Broad Street, Boston, Massachusetts 02110.

DESCRIPTION OF THE NORTHEASTERN UNITED STATES WATER SUPPLY STUDY*

The Corps of Engineers North Atlantic Division is conducting the Northeastern United States Water Supply (NEWS) Study in conformance with Title I, Public Law 89-298 (October 1965). The study area includes those river basins within the United States which drain into Chesapeake Bay, into the Atlantic Ocean north of Chesapeake Bay, into the St. Lawrence River, and into Lake Ontario. The study area includes all or a portion of 13 states including all six New England States.

The objective of the NEWS Study is the preparation of a coordinated general plan for essential water supply development in the Northeast which will recommend to the Congress an active program for Federal, State, local and private organizations. Such plans shall provide for appropriate financial participation by the States, political subdivisions thereof, and other local interests. It will thus provide a public forum where all concerned with the water supply problems of the area can be heard in developing a plan to resolve one of the major domestic problems now facing the United States.

*Source: "Announcement of formulation stage public meetings on Northeastern United States Water Supply Study, Southeastern New England area," prepared by the New England Division, Corps of Engineers, November 30, 1971.

APPENDED BY REFERENCE

The following documents are appended by reference to the 1980 Basin plan recommended by the Commission and are transmitted with the plan to the Water Resources Council and to the Basin Governors and Legislatures.

Connecticut River Basin Coordinating Committee,
Connecticut River Basin Comprehensive Water and Related
Land Resources Investigation (June 1970 - released
October 1970).

Connecticut River Basin Coordinating Committee, Draft
Environmental Statement for the Connecticut River Basin
Comprehensive Water and Related Land Resources Investi-
gation (with comments) (August 1971).

Comments addressed to the New England River Basins
Commission on the Report of the Connecticut River Basin
Coordinating Committee (November 1970 - July 1971).

Report of the Citizens Review Committee on the Connecticut
River Basin Comprehensive Water and Related Land
Resources Investigation to the New England River Basins
Commission (February 1971).

The Connecticut River Ecology Action Corporation,
Proceedings of a Symposium, "Scientists' Views on the
Connecticut River Basin Plan," Publication #1 (Hadley,
Massachusetts, June 1971).

Comments on the draft findings and recommendations of the
New England River Basins Commission on the Connecticut
River Basin Comprehensive Water and Related Land
Resources Investigation (July - November 1971).



